2021

Occupational Therapy for Pregnant Women: An Ergonomics Program for First-Time Mothers

Kaitlyn Berglund

Brianna Peterman

Occupational Therapy for Pregnant Women: An Ergonomics Program for First-Time Mothers

by

Kaitlyn Berglund, MOTS and Brianna Peterman, MOTS

Advisor: Dr. Mandy Meyer

A Scholarly Project

Submitted to the Occupational Therapy Department of the

University of North Dakota

In partial fulfillment of the requirements

for the degree of

Master of Occupational Therapy

Grand Forks, North Dakota

May 2021

This scholarly project, submitted by Kaitlyn Berglund, MOTS and Brianna Peterman, MOTS in partial fulfillment of the requirement for the Degree of Master of Occupational Therapy from the University of North Dakota, has been read by the Faculty Advisor under whom the work has been done and is hereby approved.

Faculty Advisor

April 12, 2021

Date

PERMISSION

Title: Occupational Therapy for Pregnant Women: An Ergonomics Program for First-Time Mothers

Department: Occupational Therapy

Degree: Master of Occupational Therapy

In presenting this Scholarly Project in partial fulfillment of the requirements for a graduate degree from the University of North Dakota, we agree that the Department of Occupational Therapy shall make it freely available for inspection. We further agree that permission for extensive copying for scholarly purposes may be granted by the professor who supervised our work or, in her absence, by the Chairperson of the Department. It is understood that any copying or publication or other use of this Scholarly Project or part thereof for financial gain shall not be allowed without our written permission. It is also understood that due recognition shall be given to us and the University of North Dakota in any scholarly use which may be made of any material in our Scholarly Project.

Kaitlyn Berglund

Signature

4/14/2021

Date

Brian Peterson

Signature

4/14/2021

Date

TABLE OF CONTENTS

LIST OF TABLES

ACKNOWLEDGEMENTS

The authors would like to extend a special thank you to their faculty advisor, Dr. Mandy Meyer, for all of her support, feedback, and wisdom during the entire process of developing this scholarly project. Her insight into all areas was both well received and instrumental in the success of this development. We also would like to thank our families for providing both mental and physical support during this development and answering any questions or concerns that they could.

ABSTRACT

Title: Occupational Therapy for Pregnant Women: An Ergonomics Program for First-Time Mothers
Citation: Kaitlyn Berglund, MOTS, Brianna Peterman, MOTS & Mandy Meyer, Ph.D. Department of Occupational Therapy, University of North Dakota School of Medicine and Health Sciences, 1301 N Columbia Rd, Grand Forks, ND 58203—2898

This scholarly project, *Occupational Therapy for Pregnant Women: An Ergonomics Program for First-Time Mothers,* provides occupational therapy practitioners with a 3-session group protocol to address ergonomic concerns of pregnancy and new motherhood with pregnant women who are becoming mothers for the first time. These ergonomic concerns are addressed as they specifically relate to the occupations of the clients. Through an extensive literature review, it was found that there is limited research and programming specific to occupational therapy's role in providing services to pregnant women and new mothers. Ergonomic programming for pregnant women that was previously available did not address occupations and focused mostly on musculoskeletal issues of the upper extremity. These findings identified a need for an occupational therapy ergonomic program to address other body areas affected in pregnancy and the perinatal period and provide specific intervention for the occupations of the population. Such a program is important for preventing musculoskeletal disorders in pregnant women and new mothers, improving pregnancy outcomes, and lowering healthcare costs. The product, *Ergonomics for Pregnant Women*, was developed using information in the literature, gaps in existing programming, and the personal experience Dr. Mandy Meyer who served as the faculty advisor for this scholarly project and others who have experienced pregnancy and new motherhood. The creation of the product was guided by the Person-Environment-Occupation model and the Biopsychosocial frame of reference. The product addresses ergonomic considerations for the occupations of health management and maintenance, sleep and rest, breastfeeding and other baby

care, community mobility, and leisure. The product also addresses routines and body areas other than the upper extremity, including the spine and hips to holistically approach each client and their experience of pregnancy and new motherhood.

CHAPTER I

INTRODUCTION

Approximately four million women in the U.S. get pregnant and give birth each year, many of whom experience ergonomic issues during the prenatal and perinatal periods (Pregnancy Statistics, 2009). These ergonomic issues may include altered posture and positioning, strength, repetition, exertion, contact stress, vibration, physical health and safety, and psychosocial changes that result from the interactions between the mother's cognitive and physical systems and the social, technical, organizational, and environmental systems that surround her (Fernandes, 2018; International Ergonomics Association, n.d.; Schroeder, 2013). Occupational therapists are well-equipped to address ergonomics with pregnant women by designing equipment, procedures, contexts, tasks, and roles (International Ergonomics Association, n.d.). However, there is a lack of research in the literature and a lack of programming in practice settings for occupational therapy's role in addressing ergonomic concerns in pregnant women (Fernandes, 2018; Sanders & Morse, 2005; Schroeder, 2013; Visser, Nel, la Cock, Labuschagne, Lindeque, Malan, & Viljoen, 2016).

The authors of this scholarly project addressed the gap in occupational therapy ergonomic programming for pregnant women by creating a 3-session group protocol that provides education and opportunities for application of ergonomic principles. The creation of the product was guided by the Person-Environment-Occupation (PEO) model and the biopsychosocial frame of reference to address the interactions between the mother, her environment, and her occupations with consideration for the physical, psychological, and social factors of the mother (Engel, 1997; Law, Cooper, Strong, Stewart, Rigby, & Letts 1996). The product was also guided by an

extensive literature review to effectively apply the value and the role of occupational therapy in serving pregnant women and new mothers.

Key terms and concepts used throughout this scholarly project include pregnancy, occupational therapy, ergonomics, PEO, and the biopsychosocial frame of reference. For the purposes of this project, pregnancy is operationally defined as a primiparous, or first baby for the mother, and typically developing pregnancy. Occupational therapy is defined as the profession in which practitioners use occupation, or everyday activities therapeutically to improve participation and performance in everyday life activities, roles, and routines within a client's natural settings (American Occupational Therapy Association, 2014). Ergonomics is defined as the study of work, in which there is a scientific understanding of the interactions between people and other system elements including cognitive, social, technical, organizational, environmental, and physical factors (International Ergonomics Association, n.d.). PEO, or the Person-Environment-Occupation model of practice was introduced by Law, Cooper, Strong, Stewart, Rigby, and Letts (1996), and asserts that the interactions of the person, their environment or context, and their occupations or activities must be in harmony for optimal participation and performance. Finally, the biopsychosocial frame of reference introduced by Engel (1977) asserts that a person's biology, psychology, and social influences must be considered to understand and promote a person's health.

A comprehensive literature review of pregnancy, ergonomics, and occupational therapy can be found in Chapter II. In Chapter III, a detailed description of the development of the program is presented. The program developed for this scholarly project, *Ergonomics for Pregnant Women* is found in Chapter IV. Finally, Chapter V describes areas for future research and further development of the presented program.

CHAPTER II

REVIEW OF LITERATURE

Approximately six million women in the U.S. get pregnant each year, resulting in approximately 4 million live births (Pregnancy Statistics, 2009). Seventy-five percent of pregnant women in the U.S. are married to or living with the child's father (Pregnancy Statistics, 2009). The average age of primiparous pregnant women in the U.S. was 26 years old in 2014 (Matthews & Hamilton, 2016). Many of these pregnant women experience ergonomic issues in the prenatal and perinatal periods.

Ergonomics, or the science of work, is defined as the scientific understanding of the interactions between people and other system elements (International Ergonomics Association, n.d.). Ergonomics seeks to optimize well-being and system performance by applying theory, principles, and knowledge (International Ergonomics Association, n.d.). Ergonomic considerations include cognitive, social, technical, organizational, environmental, and physical factors like posture, strength, forceful exertion, repetition, awkward or static positioning, contact stress, and vibration that influence the interactions between people and their systems (Fernandes, 2018; International Ergonomics Association, n.d.; Schroeder, 2013). Ergonomics includes cognitive and psychosocial aspects of living and physical health and safety (International Ergonomics Association, n.d.). Ergonomics may also include designing equipment, procedures, contexts, tasks, and roles (International Ergonomics Association, n.d.).

Occupational therapy's role in perinatal care for mothers, including ergonomics of baby care and breastfeeding is not well-researched and is not widely represented in the literature (Fernandes, 2018; Schroeder, 2013; Visser, Nel, la Cock, Labuschagne, Lindeque, Malan, & Viljoen, 2016). This lack of literature has led to an inadequate definition of occupational

therapy's role in serving pregnant women and new mothers and has led to a widespread lack of awareness of the skillset of occupational therapists that may be beneficial for this population (Fernandes, 2018; Visser et al., 2016). In addition to a lack of literature and understanding of the occupational therapist's role in caring for pregnant women and new mothers, it is also apparent that there is a lack of programming designed to prevent or intervene in ergonomic issues of pregnant women and new mothers (Fernandes, 2018; Sanders & Morse, 2005; Schroeder, 2013).

The following literature review will outline the ergonomic complications commonly experienced in pregnancy, what occupational therapy can do for this population, guiding theories for occupational therapists to use when working with pregnant women and new mothers with ergonomic problems, and a definition of the need for occupational therapy ergonomics education and intervention for pregnant women who are new mothers.

Ergonomic Issues in Pregnancy

Many common problems pregnant women and first-time mothers have during pregnancy can be described using ergonomics. As defined above, ergonomics considerations can include physical and psychosocial aspects of the person and movement factors and routines of the occupation (Fernandes, 2018; International Ergonomics Association, n.d.; Schroeder, 2013). Some physical ergonomic complications in pregnancy described in the literature are posture and pain or musculoskeletal disorders of the back and upper extremities (Balık, Sabri Balık, Üstüner, Kağıtcı, Şahin & Güven, 2014; Bergbom, Modh, Lundgren & Lindwall, 2017; Bey, Arampatzis & Legerlotz, 2018; Carreiro, Francisco, Abrão, Marcacine, Abuchaim, & Coca, 2018; Catena, Bailey, Campbell & Music, 2019; Fernandes, 2018; Kent, Ashton, Hardwick, Rowan, Chia, Fairclough, . . . & Geddes, 2015; Opala-Berdzik, Blaszczyk, Swider, & Cieslinska-Swider, 2018; Sanders & Morse, 2005; Schroeder, 2013; Shende & Salunkhe, 2020; Vico Pardo, López Del

Amo, Pardo Rios, Gijon-Nogueron & Yuste, 2018). An ergonomic consideration of the psychosocial aspect of the person in pregnancy and new motherhood that is described is the perception of increased demands (Sanders & Morse, 2005). Some ergonomic risk factors related to the occupations performed in pregnancy and the perinatal period that are described in the literature are forceful exertion, repetition, and contact stress (Sanders & Morse, 2005; Schroeder, 2013). Finally, a lack of routines while the mother adjusts to pregnancy and motherhood is also an ergonomic issue related to the occupations of pregnant women and new mothers (Bergbom et al., 2017; Froelich, Donovan, Ravlin, Fortier, North & Bloch, 2015).

Posture

Women endure many postural changes during pregnancy because of increased joint mobility and connective tissue laxity resulting from hormonal changes, especially increased levels of relaxin during pregnancy and up to six months postpartum (Opala-Berdzik et al., 2018).

Postural changes occur in the spinal column to compensate for center-of-balance adjustments that occur due to fetal enlargement (Bey et al., 2018; Shende & Salunkhe, 2020). Some spinal changes that occur during and after pregnancy include increased lumbar, thoracic, and cervical curvatures, and have been shown to occur even after delivery during the postnatal period when hormone levels and the uterus return to their normal levels and size (Catena et al., 2019; Shende & Salunkhe, 2020). Other postural changes include anterior pelvic tilt, shoulder protraction, and hyperextension of the knees and ankles (Shende & Salunkhe, 2020). These postural changes lead to postural instability and are attributed in part to increases in joint mobility and connective tissue laxity that occur throughout pregnancy and up to six months postpartum (Opala-Berdzik et al., 2018). Although joint mobility increases, trunk flexibility and

mobility of the hips are limited during pregnancy, further contributing to postural instability in the perinatal period (Catena et al., 2019; Opala-Berdzik et al., 2018).

In addition to natural changes in posture during pregnancy, new mothers may exacerbate issues related to posture by not using good ergonomics in baby-care tasks with high biomechanical risk (Sanders & Morse, 2005; Schroeder, 2013). One example of poor ergonomics used during baby-care tasks with high biomechanical risk is awkward or static body positioning of the pregnant woman or new mother (Sanders & Morse, 2005; Schroeder, 2013). Awkward or static positioning may occur when leaning or bending over a changing table, crib, the floor, or bathtub (Sanders & Morse, 2005; Schroeder, 2013). Awkward or static positioning may also occur when carrying the baby in a car seat, on one hip, or while bending down (Sanders & Morse, 2005).

While the consequences of poor posture during pregnancy include musculoskeletal pain and disfunction, another consequence of body and posture changes in pregnancy is falls (Bey et al., 2018; Catena et al., 2019; Opala-Berdzik et al., 2018; Sanders & Morse, 2005). Due to increased lordosis and decreased functional mobility of the hips, there is a shift away from sagittal hip motion and changes in standing angle to more spine motion (Catena et al, 2019). These changes in stand-to-sit motion may contribute to falls during pregnancy (Catena et al., 2019). Additionally, Opala-Berdzik et al. (2018) found that pregnant women exhibit increasing anterior-posterior postural sway, which may occur due to the altered proprioceptive and kinesthetic feedback from relaxed connective tissue structures, may lead to falls.

Breastfeeding and bottle-feeding posture.

One specific baby care occupation in which biomechanical risks related to awkward and static positioning may negatively influence posture is breastfeeding or bottle-feeding (Carreiro,

et al., 2018; Kent et al., 2015; Sanders & Morse, 2005; Schroeder, 2013). In a study by Carreiro et al. (2018), mothers who had not breastfed before demonstrated poor posture and awkward static positioning of themselves and their babies during breastfeeding, which may take up to 45 minutes per feeding (Schroeder, 2013).

Specific consequences of poor posture during breastfeeding or bottle feeding include early weaning, improper latch, interruption of emptying of breasts and milk production, increases in duration of each breastfeeding session, and nipple injury (Carreiro et al., 2018). Additionally, one of the most common causes of nipple pain is inadequate positioning or posture (Kent et al., 2015).

Pain & Musculoskeletal Disorders

In a study by Sanders and Morse (2005), 66% of parents reported having musculoskeletal pain. A lack of knowledge about the pain commonly experienced by pregnant women and new mothers may lead to misinterpreting dangerous signs as normal discomforts of pregnancy or misinterpreting normal discomforts of pregnancy and new motherhood as being dangerous signs of adverse pregnancy outcomes or musculoskeletal disorders (Bergbom at al., 2017). These discomforts may also lead to body dissatisfaction, and therefore depression (Bergbom et al., 2017).

Upper extremity pain and musculoskeletal disorders.

Hand and wrist pain are the second leading complaint among pregnant/perinatal women and a study by Sanders and Morse (2005), found that 11.5% of parents reported pain in the shoulders (Balik et al., 2014). This pain results from poor positioning during repetitive activities related to pregnancy and childcare with high biomechanical risk, as well as hormonal changes and fluid retention during pregnancy (Balik et al., 2014; Borg-Stein & Dugan, 2007; Sanders &

Morse, 2005). If left improperly treated or managed, pain can be exacerbated and upper extremity musculoskeletal conditions can develop and progress (Balik et al., 2014). Prenatal and perinatal women are at increased risk of upper extremity musculoskeletal conditions including carpal tunnel syndrome, De Quervain's tenosynovitis, and tendinosis of the wrist, elbow, or shoulder (Fernandes, 2018, Sanders & Morse, 2005). These upper extremity musculoskeletal conditions are diagnosed in 21% of mothers (Sanders & Morse, 2005).

Back pain and musculoskeletal disorders.

Balik et al. (2014) reported that back pain is the most common complaint of pregnancy. A study by Sanders and Morse (2005) found that 48% of mothers reported musculoskeletal pain in the low back, 17% reported pain in the neck, and 16% reported pain in the upper back. Twenty-one percent of these mothers went to see their doctor and were diagnosed with low-back strain, sciatica, or neck pain (Sanders & Morse, 2005). Lower back pain is suspected to result from increased lordosis during pregnancy because of the alteration in load distribution and increased tension in lumbar structures, and changes in spinal curve and center of balance as well as compensation for postural instability (Bey et al., 2018; Catena et al., 2019; Shende & Salunkhe, 2020). Vico Pardo et al., (2018) also found that back pain is associated with greater pronation of the right foot in pregnancy that occurs due to increasing body mass, weight, and laxity of joints causing stress on the body.

Perception of Demands

Sanders and Morse (2005) found, parent perception of the expected high demands of childcare tasks was significantly associated with greater musculoskeletal disfunction. Some examples of perceptions of high demands that lead to greater musculoskeletal disfunction include parents feeling like they do not have time to complete what they need to, and that childcare is

physically demanding (Sanders & Morse, 2005). Parents not taking enough time for themselves was also associated with greater musculoskeletal disfunction (Sanders & Morse, 2005). One measure of psychological strain among mothers is participation in hobbies, and not participating in some sort of hobby at least one hour per week was significantly associated with musculoskeletal disfunction among new parents (Sanders & Morse, 2005). This association supports the importance of taking time for oneself for optimal performance and minimized pain in pregnancy and new motherhood (Sanders & Morse, 2005).

Ergonomic Risk Factors

Ergonomic risk factors associated with occupations of pregnant women and new mothers are forceful exertion, repetition, and contact stress (Sanders & Morse, 2005, Schroeder, 2013).

Forceful exertion.

Many childcare tasks that new mothers must complete during the perinatal period have high biomechanical risk for forceful exertion (Sanders & Morse, 2005, Schroeder, 2013). Forceful exertions occur when a parent lifts or lowers their baby onto or off the floor, a crib, a changing table, a child carrier, or a car seat, especially if lifting is accompanied by twisting of the trunk of the parent (Sanders & Morse, 2005, Schroeder, 2013). Other childcare tasks with a high risk for forceful exertion are opening baby food containers and pushing the baby in a stroller uphill (Sanders & Morse, 2005). Forceful exertions may also occur when holding, dressing, changing, or bathing a restless baby (Schroeder, 2013). Each of these baby care tasks with high biomechanical risk for forceful exertion were significantly associated with greater musculoskeletal disfunction among parents (Sanders & Morse, 2005).

Repetition.

Other childcare tasks that new mothers must complete during the perinatal period have high biomechanical risk for repetition (Schroeder, 2013). Many of these repetitive baby care tasks involve feeding the baby (Schroeder, 2013). Repetitive tasks in feeding a baby include stimulating the baby during feedings to keep them awake and alert, burping the baby, massaging breasts to reduce soreness or promote milk production, and shaking, stirring, and cleaning bottles (Schroeder, 2013). Dressing a baby also has the potential for the high biomechanical risk of repetition when fastening the baby's clothes (Schroeder, 2013).

Contact stress.

A third biomechanical risk involved in many baby care tasks in the perinatal period is contact stress (Schroeder, 2013). Contact stress occurs on a new mother's hands, forearms, or knees when supporting herself over the floor to play with the baby or over the tub or sink to bathe the baby (Schroeder, 2013). Contact stress also occurs between a new mother's hands, elbows, or pelvis against the surface the mother is in contact with while feeding the baby (Schroeder, 2013). Additionally, contact stress and vibration occur on the mother's hands when pushing a stroller, especially over uneven or rough ground (Schroeder, 2013).

Forceful exertion, repetition, and contact stress that occurs during daily activities of pregnant women and new mothers are some ergonomic issues experienced by this population (Sanders & Morse, 2005, Schroeder, 2013).

Routines

Pregnancy and new motherhood can negatively affect previously maintained routines and the formation of new routines (Bergbom et al., 2017; Froelich et al., 2015). In a study by Bergbom et al. (2017), women viewed their pregnancy as a time of transition, but grew frustrated when the external signs of pregnancy were not what they had expected. This study revealed that

it takes time for pregnant women to adjust to their changing bodily appearance and sensations including fatigue and nausea (Bergbom et al., 2017). Women accepted these as normal trials before delivery and tried to adapt routines and activities to allow the body to get used to being pregnant (Bergbom et al., 2017).

Froelich et al. (2015) conducted a study investigating the development and maintenance of routines throughout the postpartum period. Difficulties in maintaining or forming routines in the prenatal and postpartum periods differ as the pregnancy and postpartum periods progress (Bergbom et al., 2017; Froelich et al., 2015). During pregnancy, women reported difficulty maintaining their routine due to fatigue and nausea (Bergbom et al., 2017). During the second and third week postpartum, zero mothers had established routines, reporting baby care was more challenging and time consuming than they had expected (Froelich et al., 2015). During the sixth through the eighth week postpartum, 56% of new mothers had a hint of a routine due to predictability to infant sleep and feeding schedules (Froelich et al., 2015). Up to the eighth week postpartum, new mothers described breastfeeding as all-consuming and variable, negatively influencing their development and maintenance of routines (Froelich et al., 2015). During the 10th through the 12th week postpartum, 86% of new mothers had an emerging routine, some including return to work and pumping (Froelich et al., 2015). The study ultimately concluded that zero new mothers that participated had developed or maintained a solid, predictable routine withing the first 12 weeks postpartum (Froelich et al., 2015).

Posture, pain, perception of demands, ergonomic risk factors, and routines are all ergonomic issues common in pregnancy and new motherhood (Balık et al., 2014; Bergbom et al., 2017; Bey et al., 2018; Carreiro et al., 2018; Catena et al., 2019; Fernandes, 2018; Kent et al., 2015; Opala-Berdzik et al., 2018; Sanders & Morse, 2005; Schroeder, 2013; Shende & Salunkhe,

2020; Vico Pardo et al., 2018). Each of these ergonomic issues can be effectively addressed by occupational therapy practitioners and their interdisciplinary team members.

Occupational Therapy Role

According to the American Occupational Therapy Association (2020a), occupational therapy "maximizes health, well-being, and quality of life for all people, populations, and communities through effective solutions that facilitate participation in everyday living" (para. 1). Occupational therapy services include holistic evaluation and personalized intervention using evidence-based daily activities therapeutically (American Occupational Therapy Association, 2020b). Occupational therapists are effective and collaborative leaders with a focus on accessibility, equity, inclusion, and diversity (American Occupational Therapy Association, 2020a). When serving pregnant women, occupational therapists are expected to provide family and occupation centered care. (Graham, Rodger, & Ziviani, 2013).

Occupational Therapy Role in Ergonomics

Occupational therapy's role in ergonomics is to promote safe performance of tasks by making suggestions about efficient and effective role performance (American Occupational Therapy Association, 2011). This may include education and recommendations about stress, pain management, posture, joint protection, and body mechanics; making adaptations to environments or task demands using assistive technology, modified tools, or other equipment; recommendation of strategies for skills related to social participation and communication, emotion regulation, and coping (American Occupational Therapy Association, 2011). Occupational therapy's distinct value in ergonomics results from the occupational therapist's understanding of the transactions between the person, the task, and the environment (American Occupational Therapy Association, 2017). Ergonomic considerations that may be addressed by occupational therapists include

postural considerations, repetition, education, and strengthening to prevent pain, improve function, and promote occupational participation (Fernandes, 2018).

Occupational Therapy Role in Ergonomics of Pregnancy

In general, occupational therapy's role is to maintain engagement in meaningful occupations throughout the prenatal and perinatal stages (Fernandes, 2018). Occupational performance coaching can be used as a strengths-based format that is focused on client goals (Graham et al., 2013). When using occupational performance coaching, the therapist uses conversation, modeling, and hands-on strategies to facilitate client problem-solving to identify strategies (Graham et al., 2013). The therapy can be guided by emotional support, information exchange, and a structured process including collaborative performance analysis (Graham, et al., 2013). Additional techniques that can be used include questioning, listening, observing, explaining, and coaching in real contexts for each individual (Graham et al., 2013). Occupational performance coaching is showing preliminary support in improving and generalizing mother occupational performance and mother's self-competence to better facilitate occupational engagement. This skill of generalization can be applied to other areas of occupation by discussing how strategies can be used in other contexts (Graham et al., 2013). Finally, significant improvements in performance and the mother's satisfaction with the performance, even when specific goals were not addressed, indicates that by setting the goals that are important to the client, client attention, persistence, and application of knowledge and skills increases, which contributes to improved performance in areas not directly addressed by interventions (Graham et al., 2013).

Posture and positioning.

Correct posture of the body occurs when minimum stress is applied to each joint (Shende & Salunkhe 2020). Occupational therapists can promote proper posture and positioning among pregnant women and new mother within the occupations of breastfeeding and bottle feeding, an occupational therapist would be referenced for assistance in this occupation for posture and positioning (Abissulo, Silvino, & Ferriera, 2016; Cosimano & Sandhurst., 2011; Degefa, Tariku, Bancha, Amana, Hajo, Kusse,. . . . & Aschalew, 2019; Fernandes, 2018; Schroeder, 2013; Sikorski, Renfrew, Pindoria & Wade, 2003; Surtees & Kelleher, 2011; Visser et al., 2016; Westerfield, Koenig, & Oh, 2018). Occupational therapists can also promote correct posture and position in everyday activities by using assistive devices, and strengthening or mobility exercises, while also working to prevent instances of forceful exertion (Bey et al., 2018; Kaux, Forthomme, Goff, Crielaard, & Croisier, 2011; Kember, Scott, O'Brien, Borazjani, Butler, Wells, . . . & Morrison, 2018; Opala-Berdzik et al., 2018; Sanders & Morse, 2005; Schroeder, 2013; Shende & Salunkhe 2020; Shivakumar, Brandon, Snell, Santiago-Muñoz, Johnson, Trivedi, & Freeman, 2011).

Positioning for bottle and breastfeeding.

When providing breastfeeding intervention, professional, face-to-face services are more effective than services provided via telehealth or support provided by individuals who are not healthcare professionals in decreasing premature cessation of breastfeeding (Sikorski et al., 2003). Interdisciplinary approaches such as collaboration with community health workers, screening, follow-up, support groups, as well as awareness and promotion should be used to address breastfeeding for a holistic approach (Visser et al., 2016). Using a population-based approach to breastfeeding intervention is a cost-effective, time-effective method to provide

support to families and communities when compared to one-to-one interventions (Visser et al., 2016). When providing breastfeeding interventions, occupational therapists can assume the roles of clinician, consultant, educator, trainer, advocate, and facilitator (Visser et al., 2016). As a consultant providing advice, the occupational therapist can address the importance of exclusive breastfeeding (Visser et al., 2016). The occupational therapist can work as a clinician in positioning ergonomically for feeding and aid in advocating with the caregivers for devices as needed. As an educator providing information, occupational therapists can inform mothers of the value of breastfeeding as well as train in positions that are most ergonomic for success in feeding (Visser et al., 2016).

The Breastfeeding Skills Training and Support program is a program providing knowledge about breastfeeding, demonstration and practice of breastfeeding skills, and support, that allows mothers to practice common positioning for breastfeeding, which improved breastfeeding effectiveness and self-efficacy (Degefa et al., 2019). This intervention program can be integrated into hospital services and community healthcare at all stages of pregnancy and the post-partum period (Degefa, et al., 2019). Skills training sessions such as these can be especially helpful to ensure proper breastfeeding positioning and attachment, which promote breastfeeding effectiveness and self-efficacy (Degefa, et al., 2019). The use of realistic simulators for breastfeeding guidance such as low-fidelity, realistic materials including an apron with breast implants, a puppet, a baby-doll, and a fake uterus with placenta attached, which were created specifically to address common problems new mothers face when breastfeeding, including positioning and handling, nipple cracks and anatomy differences, breast engorgement, lack of milk, and cramps (Abissulo et al., 2016). New mothers using the simulators reported that the simulators contributed to understanding how to properly breastfeed and that they felt the use of

the simulators promoted their health (Abissulo et al., 2016). The control group who participated in traditional education without the use of simulators reported that the use of visual demonstrations would be more effective in facilitating interaction and comprehension (Abissulo et al., 2016). Learning about breastfeeding using the simulators reduced difficulties related to breastfeeding and promoted self-care in new mothers (Abissulo et al., 2016). Using simulators as an educational method of teaching new mothers about breastfeeding reduced difficulties related to breastfeeding, including positioning, and holding the infant and the self, cracked nipples, nipple anatomy, breast engorgement, lack of milk, and cramping (Abissulo et al., 2016). The simulators are also low-cost to make and maintain (Abissulo et al., 2016).

The current literature tends to outline general recommendations for proper positioning of the mother and child when breastfeeding. Instead of supporting the child against gravity, the body should be used to support the baby. One recommendation is to bring the baby to the breast instead of bending to bring the breast to the baby (Schroeder, 2013). Also, use pillows to support both the mother and baby in positioning for feeding (Fernandes, 2018; Schroeder, 2013). Proper positioning of the infant and mother reduces nipple pain and improves the infant's latch (Westerfield et al., 2018). Proper positioning includes having the infant facing the mother, infant's neck in neutral position, nipple pointed towards the roof of the infant's mouth, with three or four centimeters of breast tissue and as much of the areola as possible in the infant's mouth (Surtees & Kelleher, 2011). Additionally, the breast should be pressed against the baby's chin, but away from the baby's nose, the baby's head and body should be aligned with their belly facing the mother's belly (Cosimano & Sandhurst, 2011; Surtees & Kelleher, 2011). For families that will bottle feed, it is recommended to keep a loose grip on the bottle, keep the wrist in a

neutral position, and support the baby's weight with larger, stronger joints of the mother's body (Schroeder, 2013).

Assistive devices.

Occupational therapists can provide services such as splints or other devices to prevent musculoskeletal pain in perinatal women (Kaux et al., 2011). Maternity support belts can aid in increasing stability in posture which can contribute to a decreased fall risk in this population (Bey et al., 2018). Also, the use of support devices, such as the PrenaBelt which promotes side lying while completing the occupation of rest and sleep can increase sleep quality and time spent asleep (Kember et al., 2018). The use of pillows to support during breast or bottle feeding, such as the Boppy® Pillow or pillows arranged in a similar C-shape can aid in decreasing discomfort and musculoskeletal pain in mothers while feeding their infant (Sri Widiastuti, Rustina, & Efendi, 2020)

Strengthening and mobility.

Occupational therapists can implement exercise programs that include upper extremity weight training and core strengthening and can teach strengthening exercises (20-30 minutes per day) and postural control interventions to prevent upper extremity pain (Kaux et al., 2011; Shivakumar et al., 2011). Occupational therapy intervention should incorporate movements that exercise the pelvis-spine complex to improve stability and should occur as long as six months postpartum (Opala-Berdzik et al., 2018). Occupational therapy interventions during and after pregnancy should avoid excessive stretching to avoid additional joint hypermobility that is common with pregnancy (Opala-Berdzik et al., 2018). One example of this is to avoid twisting of the spine by not holding the baby against the mother's hip (Schroeder, 2013).

The literature identifies the importance of awareness and control of spinal posture through therapeutic interaction, use of mirrors, and biofeedback (Shende & Salunkhe 2020). The functional relationship between posture, movement, and function through client reflection of pain and performance, mobility impairment of joints, muscles, and connective tissue through stretching and mobilization is also noted (Shende & Salunkhe 2020). The literature also identifies stabilization exercises as being body-specific and individualized to each client (Shende & Salunkhe, 2020). With this individualization it is important to recognize the psychosocial factors and emphasize individual dosage and grading (Shende & Salunkhe, 2020). Postnatal women significantly improved their postural correction by participating in a graded spinal exercise program that was individualized and implemented in the early postpartum period (Shende & Salunkhe, 2020).

Education

As a consultant providing advice, the occupational therapist can address the importance of referral and interdisciplinary teamwork (Visser et al., 2016). This can include information on sensory strategies, typical development, and age-appropriate play, and the use of social media and mobile health technology (Visser et al., 2016). As a trainer teaching specific skills, the occupational therapist can address kangaroo care, understanding infant stress cues, correct positioning, and baby relaxation (Visser et al., 2016).

Body changes and conditions.

Pregnancy changes a woman's body in many ways that first-time mothers may not expect or have prepared for and having conversations about these changes with healthcare professionals may improve knowledge about and outcomes of pregnancy and delivery (Bergbom et al., 2017). Some noted body changes typically seen in pregnancy include changes in the feet, movement of

the hips and spinal position towards lordosis and an increase in laxity of joints due to hormones in the system (Catena et al., 2019; Vico Pardo et al., 2018). Having conversations with pregnant women about their bodily experiences can increase their knowledge of their bodies, and how to care for discomforts and combat dissatisfaction, increasing self-confidence and trust in the healthcare team (Bergbom et al., 2017).

Ergonomic education.

Occupational therapy can contribute with ergonomic education by providing information about body mechanics to pregnant women about how to prevent musculoskeletal pain and discomfort (Kaux et al., 2011). Occupational therapy can educate pregnant women and new mothers about biomechanical principles that support proper alignment of the body, as well as identify risks and develop strategies. For example, strategies for transporting objects includes holding the car seat with both hands at the head and feet, and holding the baby keeping the thumb tucked in toward the hand and keeping the wrist in neutral when possible (Sanders & Morse, 2005; Schroeder, 2013)**.**

Self-care and leisure.

Parents who reported engaging in hobbies also reported significantly decreased rates of musculoskeletal pain (Sanders & Morse, 2005). Therefore, it is important for parents to continue to engage in meaningful activities and outdoor physical activity (Sanders & Morse, 2005). As a clinician, an occupational therapist can provide strategies to strengthen the mother-child bond, including eye contact and calming and relaxation strategies (Visser et al., 2016). As a consultant providing advice, the occupational therapist can address the importance of leisure time and getting adequate rest and sleep (Visser et al., 2016). The occupational therapist can also aid in sleep positioning to increase quality of sleep and decrease supine sleeping which can create

longer time spent in rest and improve quality of sleep (Kember et al., 2018). As a facilitator in primary care, occupational therapists can establish support groups, provide suggestions to involve family and friends to help if motivation is needed, making the choice about breastfeeding, and promoting the transfer of knowledge (Visser et al., 2016). The establishment of support groups can aid in promoting positive mental health of the new mothers and families through the many role transitions during the perinatal period by supporting the new mother during times of change as well as including family to provide support when a break is needed to participate in the mother's or father's own leisure and rest (Visser et al., 2016).

Adaptation and compensation.

As a clinician providing direct services to the mother, occupational therapists can make and advise on environmental adaptations, train in use of assistive devices, and provide sleep environment considerations (Visser et al., 2016). Occupational therapists can contribute by recommending devices and equipment that support alignment, such as long handled push-toys, a bathtub kneel chair, and education on how to use baby carriers or slings correctly to keep the mother's hands free for other tasks and decrease pain (Fernandes, 2018; Schroeder, 2013). Some environmental modifications that can be used include arranging the home with consideration for changing surface height of objects as needed such as changing tables and providing guidance in changing habits and modifying routines (Fernandes, 2018; Sanders & Morse, 2005). Occupational therapists can also use activity adaptation to prevent musculoskeletal discomfort in this population (Kaux et al., 2011) such as keeping a loose grip on objects and supporting the weight of the baby and other objects away from small, weak joints and use larger, stronger joints instead (Schroeder, 2013).

Managing routines.

As an educator providing information, occupational therapists can make suggestions of changes to routines, the creation of healthy habits, and can inform pregnant women and new mothers about the roles and responsibilities of breastfeeding or bottle feeding (Visser et al., 2016). To prevent musculoskeletal discomfort and pain in parents, it is important that parents feel that they have control over their time (Visser et al., 2016). Occupational therapists can contribute by helping new parents to manage both daily and weekly schedules and how to exert control, participate in leisure, examine stressors, and improve social support and self-efficacy (Visser et al., 2016). Preparing pregnant women for a specific breastfeeding routine or schedule has been found to not be helpful (Froelich et al., 2015). It is also recommended to not include too much information, conflicting information, or unwanted advice, and medical interventions (Froelich et al., 2015). However, when providing education about managing routines it is important to include the woman's supports, including the husband or partner, friends, and family in the sessions, include hand-on support of consultation, meals, housework, and healing supports, as well as more information or a place to ask questions, and positive supportive statements from family, friends, and medical providers in the program (Froelich et al., 2015). It is suggested in the literature to include observation, interaction with currently breastfeeding mothers, technical preparation including pumping, storing, introducing bottles, latching, coping, when to initiate breastfeeding, and breastfeeding classes when preparing pregnant women for the routines of motherhood (Froelich et al., 2015).

It is important to address the entire person in a holistic form while working with the new mother and family to come up with ideas for structuring and implementing new routines. This is especially appropriate for occupational therapy practitioners to address, as routines are one example of the many performance patterns related to the occupations of health management and

maintenance and home management and maintenance (American Occupational Therapy Association, 2014).

Guiding Theories

Person-Environment-Occupation Model

Occupational therapy's distinct value in pregnancy and ergonomics results from the occupational therapists understanding of the transactions between the person, the task, and the environment, which can be supported using the Person-Environment-Occupation PEO) model (American Occupational Therapy Association, 2017; Law, Cooper, Strong, Stewart, Rigby, & Letts 1996). The PEO model asserts that the person, environment, and the occupation must all be in harmony for optimal occupational participation to occur (Law et al., 1996). Person factors in this population include motor abilities such as strength, coordination, and endurance that are necessary for the fluid, efficient, and pain-free motion required for self and childcare occupations (Law et al., 1996). The mother's physical environments include the home, workplace, leisure locations, and anywhere else where occupations of motherhood occur (Law et al., 1996). The mother's social environments include the social-emotional support stemming from her relationships with friends, family members, coworkers, healthcare providers, and others (Law et al., 1996). The mother's occupations may include self-care and home maintenance tasks including showering, dressing, hygiene, cooking, cleaning, laundry, and childcare tasks such as holding, lifting, carrying, and breastfeeding the baby (Law et al., 1996).

Biopsychosocial Frame of Reference

Another theory useful for application with the perinatal population is the biopsychosocial frame of reference (Engel, 1977; Fernandes, 2018). The biopsychosocial frame of reference takes into consideration the medical model plus the patient, social context, and societal systems to

understand health and disfunction (Engel, 1977). The biopsychosocial frame of reference also asserts that differentiating between health and disfunction will not always be clear due to the cultural, social, and psychological influences (Engel, 1977). Within the biopsychosocial frame of reference, healthcare providers must determine the contributions of the biological, psychological, and social factors influencing a patient's health (Engel, 1977). These assumptions and assertions align well with the assumptions and assertions of both ergonomics and the Person-Environment-Occupation model (International Ergonomics Association, n.d.; Law et al., 1996)

Definition of Need

In the literature, occupational therapy's role in the ergonomics of baby care and breastfeeding, and in perinatal care for mothers in general, is not well-researched and is not widely represented (Fernandes, 2018; Schroeder, 2013; Visser et al., 2016). Due to this lack of literature, there is an inadequate definition of occupational therapy's role in serving pregnant women and new mothers and a widespread lack of awareness of the potential benefits occupational therapists may provide for the population (Fernandes, 2018; Visser et al., 2016).

In addition to a lack of supporting literature and general understanding of the occupational therapist's role in caring for pregnant women and new mothers, the literature also reveals that there is a lack of programming designed to prevent or intervene in ergonomic issues of pregnant women and new mothers (Fernandes, 2018; Sanders & Morse, 2005; Schroeder, 2013). Occupational therapy wellness programs that are designed to prevent or remediate ergonomic issues in pregnancy and new motherhood need to address physical concerns for body parts other than the upper extremity, especially the back and the neck to minimize pain and healthcare cost and optimize parental role functioning (Sanders & Morse, 2005; Schroeder, 2013). This is especially important because the population of pregnant women is large, and many

pregnant and perinatal women do not disclose musculoskeletal pain to their doctors because it is something they expected to be normal in pregnancy and the perinatal period, and later arrive in occupational therapy for problems that have already progressed to a musculoskeletal disorder (Fernandes, 2018; Sanders & Morse, 2005). Ergonomic intervention and prevention for pregnant women and new mothers should also be expanded beyond physical considerations to include routines and task prioritization or delegation (Schroeder, 2013). Occupational therapy wellness programs are especially qualified to provide ergonomic prevention, education, and intervention to pregnant women and new mothers to address pain and roles, as well as promote health and well-being through occupation (Fernandes, 2018; Sanders & Morse, 2005; Schroeder, 2013; Visser et al., 2016).

To address these areas of need, the authors of this scholarly project have created an occupational therapy ergonomics program for pregnant women who are new mothers with typically progressing pregnancies titled *Ergonomics for Pregnant Women.* The purpose of this program is to provide education and opportunities for application of ergonomic concepts to pregnant women who are new mothers to address and prevent musculoskeletal pain and conditions to promote the highest level of function in the mother's occupations and the greatest quality of life through this time of transition. The program addresses the mother's occupations of health management and maintenance, sleep and rest, breastfeeding, baby care, community mobility, and leisure. The program focuses on musculoskeletal concerns of the spine and hips to address the lack of programming addressing these body areas. The authors also included education and activities to address routines to expand the intervention beyond the physical changes new mothers experience in pregnancy.

The creation of the program was guided by the PEO model and the Biopsychosocial frame of reference. The PEO model was used to address the person factors, environmental factors, and occupational factors in an integrated manner to clearly recognize the interactions between the three that result in the mother's occupational performance (Law, Cooper, Strong, Stewart, Rigby, & Letts 1996). The Biopsychosocial frame of reference was used to ensure consideration of all aspects of the new mother, including their biology, psychological status, and social context in the creation of the product (Engel, 1997). The authors directly applied the information in this literature review during the creation of the program to clearly display the value and the role of occupational therapy in serving pregnant women and new mothers.

The entirety of this product can be found in Chapter IV. Additionally, a detailed account of the methods and activities used to create this product can be found in Chapter III.

CHAPTER III

METHODOLOGY

Chapter III provides a detailed description of the process used to create this scholarly project. This scholarly project was completed to fulfill the graduation requirements for the Master's of Occupational Therapy program at the University of North Dakota. Before beginning the project, the authors of this scholarly project expressed mutual interest in occupational therapy practice with infants and new mothers. After discussion with various faculty members in the University of North Dakota Occupational Therapy Department, the authors decided to focus on the role of occupational therapy in ergonomics and role transition with pregnant women and new mothers.

Literature Review

The authors conducted an extensive review of the literature to identify current occupational therapy practice in ergonomics, role transition, pregnancy, and new mothers. The authors reviewed articles from PubMed, CINAHL, PsychInfo, and Google Scholar, as well as sources through the American Occupational Therapy Association, International Ergonomics Association, clinical websites, and blogs related to pregnancy and motherhood. The authors found extremely limited evidence related to occupational therapy and role transition with pregnant women and new mothers, and the focus of the scholarly project shifted to occupational therapy's role in ergonomics with pregnant women and new mothers.

The literature review revealed that this area of practice is not well-researched or represented (Fernandes, 2018; Schroeder, 2013; Visser, Nel, la Cock, Labuschagne, Lindeque, Malan, & Viljoen, 2016). The lack of literature and representation of occupational therapy practice in ergonomics with pregnant women results in an inadequate definition and awareness

of the role of occupational therapy in this practice area (Fernandes, 2018; Visser et al., 2016). The literature also revealed a lack of programming designed for occupational therapy ergonomic prevention and intervention with pregnant women and new mothers (Fernandes, 2018; Sanders & Morse, 2005; Schroeder, 2013). The limited programming that currently exists focuses on physical concerns of the upper extremity with little consideration for physical concerns of the back or neck, or concerns unrelated to biology like routines and occupational participation (Fernandes, 2108; Sanders & Morse, 2005; Schroeder, 2013;Visser et al., 2016).

While reviewing the trends in the literature, the authors identified that the themes and concepts present in the literature could be understood through the lens of the Person-Environment-Occupation (PEO) model (Law, Cooper, Strong, Stewart, Rigby, & Letts, 1996). The PEO model assumes that the person, environment, and occupation are related in a transactive way that must be harmonious for optimal occupational participation and performance (Law et al., 1996). Using the PEO model, occupational therapists can understand these transactions to create interventions promoting occupational participation and performance (Law et al., 1996). The trends in the literature also revealed that the themes and concepts present in occupational therapy practice with ergonomics and with pregnant women can be understood through the biopsychosocial frame of reference (Engel, 1977; Fernandes 2018). The biopsychosocial frame of reference asserts that healthcare providers must consider the biological, psychological, and social factors influencing a patient's health and create interventions to address each as needed (Engel, 1977).

Inclusion of Product Content

Various sources in the literature described areas of need for ergonomic occupational therapy prevention and intervention with pregnant women and new mothers. The literature

identified service needs including physical intervention for posture and pain of the back, coping with increased demands and lack of routine, and education or training to prevent ergonomic risk factors including forceful exertion, repetition, and contact stress (Balık, Sabri Balık, Üstüner, Kağıtcı, Şahin & Güven, 2014; Bergbom, Modh, Lundgren & Lindwall, 2017; Bey, Arampatzis & Legerlotz, 2018; Carreiro, Francisco, Abrão, Marcacine, Abuchaim, & Coca, 2018; Catena, Bailey, Campbell & Music, 2019; Fernandes, 2018; Kent, Ashton, Hardwick, Rowan, Chia, Fairclough, . . . & Geddes, 2015; Opala-Berdzik, Blaszczyk, Swider, & Cieslinska-Swider, 2018; Sanders & Morse, 2005; Schroeder, 2013; Shende & Salunkhe, 2020; Vico Pardo, López Del Amo, Pardo Rios, Gijon-Nogueron & Yuste, 2018). Specific population needs are described through the lens of the PEO model and biopsychosocial frame of reference in Table 1. These specific needs were included in the content of the group protocol. The content of the protocol was also influenced by the personal experience of the creators' advisor, Dr. Mandy Meyer.

The authors researched best practice for occupational therapy in ergonomics and with pregnant women and new mothers. The literature review revealed that occupational therapists should address posture and positioning during breast or bottle-feeding and other occupations using assistive devices and exercise (Abissulo, Silvino, & Ferriera, 2016; Bey et al., 2018; Cosimano & Sandhurst, 2011; Degefa, Tariku, Bancha, Amana, Hajo, Kusse, . . . & Aschalew, 2019; Fernandes, 2018; Kaux, Forthomme, Goff, Crielaard, & Croisier, 2011; Kember, Scott, O'Brien, Borazjani, Butler, Wells, . . . & Morrison, 2018; Opala-Berdzik et al., 2018; Sanders & Morse, 2005; Schroeder, 2013; Shende & Salunkhe, 2020; Shivakumar, Brandon, Snell, Santiago-Munoz, Johnson, Trivedi, & Freeman, 2011; Sikorski, Renfrew, Pindiora, & Wade, 2003; Surtees & Kelleher, 2011; Visser et al., 2016; Westerfield, Koenig, & Oh, 2018) . Occupational therapists should also provide education about body changes and musculoskeletal

conditions and ergonomic risks that affect participation in the woman's occupations (Bergbom et al., 2017; Kaux et al, 2011). Additionally, occupational therapists should promote adaptation and compensation, management of routines, and participation in self-care and leisure occupations during pregnancy and the perinatal period (Fernandes, 2018; Kaux et al., 2011; Sanders & Morse, 2005; Schroeder, 2013; Visser et al., 2016). Intervention principles and techniques described in the literature were adapted as needed and applied to the creation of the group protocol. These principles and techniques are summarized through the lens of the PEO model and biopsychosocial frame of reference in Table 1.

Table 1
PEO Transactions and Biopsychosocial Concepts in the Literature Review

Biopsychosocial Concepts	**P x E**	**E x O**	**P x O**
Bio-	Maternity support belts can aid in increasing stability in posture (Bey et al., 2018). Use of positioning aids for breast or bottle feeding can decrease discomfort and musculoskeletal pain (Fernandes, 2018; Schroeder, 2013; Sri Widiastuti, Rustina, & Efendi, 2020). Devices and equipment including long-handled push toys and bathtub kneel chairs reduce exposure to ergonomic risk factors (Fernandes, 2018; Schroeder, 2013). Environmental modifications such as moving items within reach and adjusting surface height can reduce exposure to ergonomic risk factors (Fernandes,	Training in use of assistive devices to promote side lying can increase sleep quality and time spent asleep (Kember et al., 2018; Visser et al., 2016). Postural support belts can decrease fall risk (Bey et al., 2018).	Posture and other body changes including tissue laxity, center-of-gravity shifts, increased spinal curvatures, and hip tilt contribute to increased risk of falls, and pain in the back and neck, limiting occupational participation (Balik et al., 2014; Bey et al., 2018; Catena et al., 2019; Opala-Berdzik et al., 2018; Sanders & Morse, 2005; Shende & Salunkhe, 2020). Activities during and after pregnancy should avoid excessive stretching to avoid additional joint hypermobility (Opala-Berdzik et al., 2018). Pregnant women should avoid supine position after first trimester for more than 3 minutes to avoid compression of the inferior vena cava (Jeffcoat, 2014). OT exercise programs that include the pelvis-spine complex can improve core strength

	2018; Sanders & Morse, 2005)	and postural stability and correction, (Kaux et al., 2011; Opala-Berdzik et al., 2018; Shende & Salunkhe, 2020; Shivakumar et al., 2011). Awareness and control of spinal posture through therapeutic interaction, use of mirrors, and biofeedback increases rate of improvement in postural stability and control (Shende & Salunkhe 2020). Proper positioning of the infant and mother, including keeping the infant's neck in neutral with head and body aligned, nipple pointed toward the roof of the infant's mouth, and breast placed against the baby's chin reduces nipple pain and improves the infant's latch (Cosimano & Sandhurst, 2011; Surtees & Kelleher, 2011; Westerfield et al., 2018). **PXO BIO CONT.** Baby care and community mobility occupations expose the new mother to ergonomic risks including forceful exertion, repetition,

			contact stress, and vibration (Sanders & Morse, 2005; Schroeder, 2013). Ergonomic risk factors exacerbate natural body changes resulting in greater pain and musculoskeletal disfunction (Balik et al., 2014; Sanders & Morse, 2005; Schroeder, 2013) Alternative strategies of completing occupations to avoid ergonomic risks can be taught to reduce pain and musculoskeletal disfunction (Kaux et al., 2011)
Psycho-	**PXE CONT.** Use of visual demonstrations and practice are more effective in facilitating interaction and comprehension of knowledge about breastfeeding (Abissulo et al., 2016). Social support groups promote positive mental health in pregnant women and new mothers (Visser et al., 2016).	**EXO CONT.** Individualized and body-specific intervention through dosage and grading improves participation in OT exercise programs (Shende & Salunkhe, 2020).	**PXO CONT.** Lack of knowledge about pain commonly experienced by pregnant women and new mothers can lead to misinterpreting dangerous signs as normal discomforts of pregnancy, or misinterpreting normal discomforts of pregnancy as being dangerous signs of adverse pregnancy outcomes or musculoskeletal disorders (Bergbom at al., 2017).

	Feelings of being in control, facilitated by creating and managing daily or weekly schedules, prevents musculoskeletal pain and disfunction in new parents (Visser et al., 2016).		Client reflection of the client reflection of pain and performance, mobility impairment of joints, muscles, and connective tissue through stretching and mobilization improves the functional relationship between posture, movement, and function (Shende & Salunkhe 2020). Outdoor physical activity promotes mental health (Sanders & Morse, 2005).
Social	**PXE CONT.** Involving social supports of the woman is important for motivation, decision-making, and generalization of knowledge and performance throughout pregnancy and new motherhood (Visser et al., 2016).	**EXO CONT.** Changing habits and modifying routines promotes participation in valued occupations (Fernandes, 2018; Sanders & Morse, 2005). Establishment of support groups for pregnant women and new mothers promotes participation in leisure, self-care, and rest occupations (Visser et al., 2016).	

Table 1

Product Organization

The content of the protocol was organized using the PEO model and the biopsychosocial frame of reference (Engel, 1977; Law et al., 1996). Similar occupations as outlined in the Occupational Therapy Practice Framework 3rd edition were grouped to create the three separate sessions (American Occupational Therapy Association, 2014). The interventions within each session were grouped by whether the focus of the intervention was on the person, the environment, or the occupation. The interventions within each PEO domain were then grouped by the focus on biological, psychological, or social aspects of the person, environment, or occupation. A summary of the application of the PEO model and the biopsychosocial frame of reference to the organization of the product's three sessions can be found in Table 2, Table 3, and Table 4.

Table 2

PEO Transactions and Biopsychosocial Concepts in Session 1

	P X E	**E X O**	**P X O**
Bio-	Participants will demonstrate the ability to correctly use presented postural aids and sleeping devices (Goal 3).		Participants will correctly perform exercises of a graded spinal exercise program to promote good posture and prevent musculoskeletal pain (Goal 2 & Activity 1).
Psycho-	Discussion.		Participants will verbalize understanding of typical body changes during pregnancy and how those changes can influence and are influenced by the occupations of health management and maintenance and sleep (Goal 1). Discussion.
Social		Inclusion of family members promotes carryover of skills into natural contexts	

Table 2

Table 3

PEO Transactions and Biopsychosocial Concepts in Session 2

	P X E	**E X O**	**P X O**
Bio-	Participants will utilize baby dolls and pillows to simulate breast- and bottle-feeding positioning with therapist feedback on adjustments (Activity 1).		Participants will demonstrate correct positioning throughout different opportunities for breast or bottle feeding (Goal 2).
	Participants will utilize ergonomically sound equipment and environmental modifications to simulate other baby care positioning with therapist feedback on adjustments (Activity 2).		Participants will demonstrate proper positioning for completing other baby cares (Goal 3).
Psycho-	Discussion.	Discussion	Participants will verbalize understanding of the importance of the different ways of positioning during breast- or bottle-feeding (Goal 1).
			Discussion

Social	Inclusion of a family member promotes carryover of skills into natural contexts.

Table 3

Table 4

PEO Transactions and Biopsychosocial Concepts in Session 3

	P X E	**E X O**	**P X O**
Bio-	Participants will demonstrate proper use of presented baby carriers and ergonomically sound methods for community mobility with an infant (Activity 1).	Discussion.	Participants will demonstrate ergonomically correct strategies for community mobility (Goal 2).

Psycho-	Discussion	Participants will evaluate how their current routines influence their participation in valued occupations (Activity 3). Discussion	Participants will verbalize understanding of the importance of leisure, community mobility, and routines during pregnancy and new motherhood, as well as the ergonomic risks associated with these occupations in new motherhood (Goal 1). Participants will identify current or future leisure opportunities to participate in during pregnancy or new motherhood (Goal 3). Discussion.
Social	Discussion.	Participants will create a support/leisure group (Activity 2) Discussion.	

Table 4

CHAPTER IV

PRODUCT

Ergonomics for Pregnant Women

Developed By: Kaitlyn Berglund, MOTS & Brianna Peterman, MOTS
With Advisement From: Mandy Meyer, PhD
University of North Dakota Occupational Therapy Program

Preface

Up to four million pregnant women in the U.S. experience ergonomic complications during pregnancy and after birth each year (Pregnancy Statistics, 2009). This three-session program is the first occupational therapy ergonomic program for pregnant women who are new mothers. The participants of this group will learn about and practice strategies addressing ergonomic considerations for the occupations of health management and maintenance, sleep, breastfeeding, baby care, community mobility, and leisure through the lens of the Person-Environment-Occupation (PEO) model and the biopsychosocial frame of reference (Engel, 1977; Law, Cooper, Strong, Stewart, Rigby, & Letts 1996).

Some tips/tricks for use of the *Ergonomics for Pregnant Women* program are as follows:

- The first session of this program is recommended to be attended towards the end of the first trimester, while the second two sessions are recommended to be attended in the third trimester.
- Each session includes a PDF handout that is to be sent to the participants via email for their use at home. A sample flyer is also included in the product that you are welcome to edit and use for promoting the program in your area.

- The program requires the user to provide examples of ergonomically sound equipment designed for pregnant women and new parents for the participants to trial and practice using. Suggested materials are listed within the *Background Information for the Therapist* section of each session. However, if the user has access to other similar products, the user is encouraged to include them in the session as well. *The suggested materials are not an exhaustive list. Users and participants are encouraged to search for ergonomically sound products that best fit their needs.*
- Within each session, standard print represents information that should be shared with the participants. The information may be presented verbally or in other formats per the preference of the presenter.

  Bolded print represents actions the presenter should take or instructions to give to the participants.
- All photos and other graphics were created by the program developers, unless otherwise noted.

The authors of this program thank you for filling the need in this area in your practice.

Sincerely,

Kaitlyn Berglund, MOTS & Brianna Peterman, MOTS

Table of contents

Introduction to Product

Group Population

The group population that this information best applies to is that of first-time pregnant women with a typical pregnancy without complications. The initial meeting is most applicable to those in their early gestational period, with the second and third sessions following in the mid and later stages of gestation to best apply the material.

Frame of Reference & Occupation-Based Model

The frame of reference utilized to guide this product is the Person-Environment-Occupation (PEO) model introduced by Law, Cooper, Strong, Stewart, Rigby, and Letts (1996). The interactions between each area of person, environment, and occupation are utilized to apply the information in a well-rounded manner to cover the information in a useful manner for the population. These interactions between the aspects of the person and how their environment and their chosen occupations all cohabitate in the individual's day to day life is applied to this product layout and information to address these areas of interaction as they are seen in daily life. The biopsychosocial frame of reference introduced by Engel (1977) was also used to guide the creation of the program. The biopsychosocial frame of reference asserts that all aspects of the person, biology, psychology, and social context, must be considered and addressed in healthcare (Engel, 1977). Tables representing the interactions of the person, environment, and occupation and the biological, psychological, and social aspects of the participants can be found in the introduction of each session.

Purpose Statement

The goal of this product is to provide ergonomic education to pregnant women and their families to help prevent and address pain and musculoskeletal conditions that are common in pregnancy and life with an infant.

Overview and Brief Description of Protocol Sessions

This product is made up of three sessions designed to address pertinent areas of information for this population. The first session addresses both sleep and health management and maintenance and looks at positioning of the body for best rest as well as a short exercise program to address areas of musculature to prevent pain and ergonomic difficulties from body changes experienced during pregnancy. The second session addresses breast or bottle feeding as well as other baby care that a parent will perform. This session specifically looks at positioning for awkward and static positions that may cause ergonomic strain. The participants are invited to trial different positioning devices for each activity to make educated decisions about what could be beneficial for them. The third and final session addresses routines, leisure, and community mobility. The aim of this session is to address the importance of both routines and leisure in the life of a new parent, and how to achieve a balance of those as well as how to go out into the community with their new infant.

Outcome Criteria

The outcome criteria will be monitored using a short satisfaction survey that is to be sent to the participants when they finish all three sessions and returned to the program developers one month postpartum. The survey will include an opportunity for the participants to give feedback about areas that were not covered in the sessions that may be desirable to develop sessions for in the future. This will allow the program developers to make changes to the protocols as well as develop more sessions based on this information. The satisfaction survey can be found in Appendix A on page 123.

Time/Place of Meeting

Refer to Appendix B on page 125. This appendix contains a flier with current formatting to be updated for each date and time of session as well as location.

Session 1:
Health Management and Maintenance and Sleep During Pregnancy

Background Information for Therapist:

In the first session, the occupations of health management and maintenance and sleep during pregnancy are addressed. It is suggested, but not required, that this session is attended by pregnant women who are new mothers between 3-4 months gestation. Pregnant women who are already mothers and one family member or significant other per participant are also welcomed to attend.

The goals for this session are as follows:

1. Participants will verbalize understanding of typical body changes during pregnancy and how those changes can influence and are influenced by the occupations of health management and maintenance and sleep.
2. Participants will correctly perform exercises of a graded spinal exercise program to promote good posture and prevent musculoskeletal pain.
3. Participants will demonstrate the ability to correctly use presented postural aids or sleeping devices.

The bodies of pregnant women are going through incredible changes including increased joint and connective tissue mobility, increased spinal curvatures, anterior pelvic tilt, and hyperextension of the knees and ankles, which can lead to postural instability, falls, and most commonly, musculoskeletal pain (Bey Arampatzis, & Legerlotz, 2018; Catena, Bailey, Campbell, & Music, 2018; Opala-Berdzik, Blaszczyk, Swider, & Cieslinska-Swider, 2018; Shende & Salunkhe, 2020). A pregnant woman's understanding of the changes her body will go through during pregnancy and how those changes will affect her health and sleep is important because it may prevent new mothers from misinterpreting dangerous signs as normal discomforts of pregnancy or misunderstanding normal discomforts of pregnancy and new motherhood as being dangerous signs of adverse pregnancy outcomes or musculoskeletal disorders (Bergbom, Modh, Lundgren, & Lindwall, 2017). Performance of graded spinal exercises is important for pregnant women who are new mothers because they were shown to significantly improve postural correction when it was individualized, implemented early, with the inclusion of biofeedback principles to master postural control, and a personal understanding of the relationship between posture, movement, and function, which may lead to a decreased fall risk and incidence of pain (Shende & Salunkhe, 2020). The ability to correctly use adaptive devices is important because postural aids can improve stability and posture and decrease fall risk, while sleeping devices can increase time asleep and quality of sleep (Bey et al., 2018; Kember, Scott, O'Brien, Borazjani, Butler, Wells, . . . & Morrison, 2018).

The activities performed in this session are graded spinal exercises and exploration of adaptive devices. In addition to the contents of this group protocol manual, materials include yoga mats for each individual or large gym mats to accommodate the group ($10 - $150 each according to incstores.com (2021) and Walmart (2021b)), exercise balls for each participant (approx. $7 each according to

Amazon (2021b), one or more portable full-body mirrors (approx. $7 each according to Walmart (2021a), one or more maternity support belts ($30 - $65 each according to Motherhood® Maternity (n.d.) and Vitality Medical (2021)), and one or more sleep positioning pillows ($16 - $80 each according to Boppy® (2021b) and Queen Rose (2021)). The occupational therapist leading the group may also bring additional postural aids or sleeping devices depending on availability.

It is important that this session preferably be performed during the first trimester because it is focused on prevention of musculoskeletal disorders and adverse pregnancy outcomes. At this time in pregnancy, many women have experienced very few visible body changes, and have not yet experienced the major postural changes or pain commonly associated with pregnancy. This session is intended to provide pregnant women who are new mothers with an accurate understanding of the changes ahead and equip them with the skills to maintain and manage their health and sleep occupations throughout their pregnancy. Other considerations for the participants of this session at this stage of pregnancy are to avoid excessive stretch during exercise or other activities that promote additional hypermobility of joints and connective tissues (Opala-Berdzik et al., 2018). Additionally, supine exercises should be discontinued if they occur for more than three minutes after the first trimester to avoid compression of the inferior vena cava (Jeffcoat, 2014).

The creation of this session was guided by the Person-Environment-Occupation model and the biopsychosocial frame of reference. This session's activities address the person when teaching graded spinal exercises to improve the pregnant woman's posture, strength, and stability. This session's activities address the environment when introducing adaptive devices to use for postural stability and sleep. The session's activities address the occupation when suggesting alternative sleeping positions to prevent adverse pregnancy outcomes. The person's biology is

heavily emphasized in this session through the focus on the woman's body changes. The social connections of the participant are addressed by including family members in the sessions and encouraging them to promote carryover of skills learned in the session throughout the duration of the pregnancy. A summary of the PEO transactions and biopsychosocial concepts addressed in this session is found in Table 1.

Table 1

PEO Transactions and Biopsychosocial Concepts in Session 1

	P X E	**E X O**	**P X O**
Bio-	Participants will demonstrate the ability to correctly use presented postural aids and sleeping devices (Goal 3).		Participants will correctly perform exercises of a graded spinal exercise program to promote good posture and prevent musculoskeletal pain (Goal 2 & Activity 1).
Psycho-	Discussion.		Participants will verbalize understanding of typical body changes during pregnancy and how those changes can influence and are influenced by the occupations of health management and maintenance and sleep (Goal 1). Discussion.

Social		Inclusion of family members promotes carryover of skills into natural contexts	

Table 1

Delivery of Session 1: INTRODUCTION

Warm-up: Group Introductions

Objective 1: Participants will verbalize understanding of typical body changes during pregnancy and how those changes can influence and are influenced by the occupations of health management and maintenance and sleep.

Objective 2: Participants will correctly perform exercises of a graded spinal exercise program to promote good posture and prevent musculoskeletal pain.

Objective 3: Participants will demonstrate the ability to correctly use presented postural aids and sleeping devices.

Background Information for Participants:

- In a study conducted by Bergbom et al. (2017), many mothers misinterpreted dangerous signs as normal discomforts of pregnancy or misinterpreted normal discomforts of pregnancy and new motherhood as being dangerous signs of adverse pregnancy outcomes or musculoskeletal disorders. It is important to educate new mothers about the body changes related to pregnancy.
    - Body changes common during pregnancy include increased joint and connective tissue mobility due to hormonal changes, increased spinal curvatures and anterior pelvic tilt to accommodate for the enlarging fetus, and hyperextension of the knees and ankles to compensate for center-of-gravity changes as the abdomen enlarges (Bey et al., 2018; Catena et al., 2018; Opala-Berdzik et al., 2018; Shende & Salunkhe, 2020). These changes can lead to postural instability, falls, and most commonly, musculoskeletal pain (Bey et al., 2018; Catena et al., 2018; Opala-Berdzik et al., 2018; Shende & Salunkhe, 2020).
    - Increased connective tissue laxity also impairs the body's sense of position in space (Opala-Berdzik et al., 2018). And while the fetus grows, hip and trunk motion are blocked (Catena et al, 2019). Together, these factors lead to further concern for instability and falls (Catena et al., 2019; Opala-Berdzik et al., 2018).
    - As the fetus enlarges, the hips tilt forward, the lower back and neck become more concave, and the thoracic region becomes more convex (Catena et al., 2019; Shende & Salunkhe, 2020). In addition, the body relies more on movement of the spine to compensate for limited hip and trunk motion (Catena et al., 2019). This poor, unnatural posture and movement places added stress on the bones, ligaments, and

muscles of the back, leading to pain (Bey et al., 2018; Catena et al., 2019; Shende & Salunkhe, 2020).

- In a study by Sanders and Morse (2005), 66% of pregnant women and new mothers reported having musculoskeletal pain, with the back being the primary concern (Balik, Sabri Balık, Üstüner, Kağıtcı, Şahin, & Güven, 2014). The study by Sanders and Morse (2005) found that 48% of mothers reported pain in the low back, while 17% reported pain in the neck, and 16% reported pain in the upper back. Of these new mothers, 21% percent were diagnosed with musculoskeletal disorders beyond what is considered normal for pregnancy (Sanders & Morse, 2005). These diagnoses included low-back strain, sciatica, and neck pain (Sanders & Morse, 2005).
- In this session, graded spinal exercises to strengthen and maintain the structures of the pregnant woman's changing body will be introduced to prevent falls, musculoskeletal pain, and musculoskeletal disorders. (Shende & Salunkhe, 2020).
- This session will also introduce adaptive devices to promote good ergonomics, posture, and stability and decrease risk of falls and pain. (Bey et al., 2018; Kember et al., 2018)

- Importance of sleep during pregnancy
  - Sleep is important during pregnancy to not only give the mother rest, but also time to energize and help provide needed energy to grow the fetus.
  - Other anatomical concerns during sleep include pressure on hips and strain on the belly and back when attempting to sleep in side-lying. Hip alignment as well as support of the weight of the abdomen are important to help aid in restful sleep.

- As the fetus enlarges, it is important for the pregnant woman to avoid sleeping on her back, as the fetus can compress the large blood vessel that returns the blood from the lower body to the heart, which may lead to health risks for the mother and baby (Jeffcoat, 2014).
- Rationale for sleep intervention: Sleep is an important daily activity that aids in rest and rejuvenation to provide necessary energy to grow the fetus and maintain a healthy body. Addressing the ability to get adequate and productive sleep time is important during this time for the health of both mother and baby.

ACTIVITIES

Activity 1: Graded Spinal Exercises

Graded spinal exercises, adapted from (Shende & Salunkhe, 2020). These exercises are recommended to be performed 5 days per week for at least three weeks. Set 1 only will be performed during the first week, or until the pregnant woman feels that she has mastered the exercises. At that point, both sets 1 and 2 will be performed, continuing for another week or until the pregnant woman feels that she has mastered the exercises. At that point, repetitions and time holding the positions can be increased as appropriate for the pregnant woman. A home exercise program outlining these exercises can be found in the Session 1 PDF presented during the group summary located on page 69-75

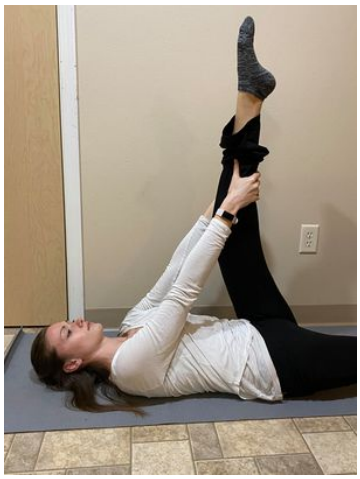
Demonstrate each exercise. Allow each exercise to be performed by the participants, approximately 10 repetitions each. Encourage the use of mirrors for biofeedback promoting awareness and control of body position. Inform participants that they should not perform exercises laying on their back for more than 3 minutes at a time. Also inform participants to avoid excessive stretching to maintain joint integrity.

Set 1:

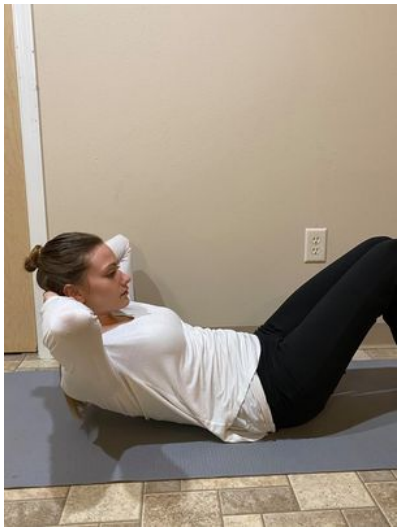
- Warm-up - Choice of squats, lunges, side bending, hip rotation, hip flexion and extension, or other light exercise.
- Breathing exercises
    - Pursed-lip breathing: Begin seated or laying down supine. Breathe in through the nose, out through the mouth, as if blowing out a candle.

    - Diaphragmatic breathing: Begin laying down supine. Place one hand over the sternum, another hand just below the ribcage. Inhale through the nose, exhale through the mouth, focusing on the movement of the inferior hand.

- Hip extensors stretch: Begin laying down supine with extended legs. Lift one leg at the hip. The participant may provide a stretch on their own by using their arms to pull the leg towards the body. The therapist or a partner may assist the participant by pushing the leg towards the body for the participant.



- Strengthening
    - Basic crunches: begin laying supine with knees flexed and feet on the floor. With hands behind the head and elbows pointing outward, lift the head and shoulders. Hold 5 seconds.



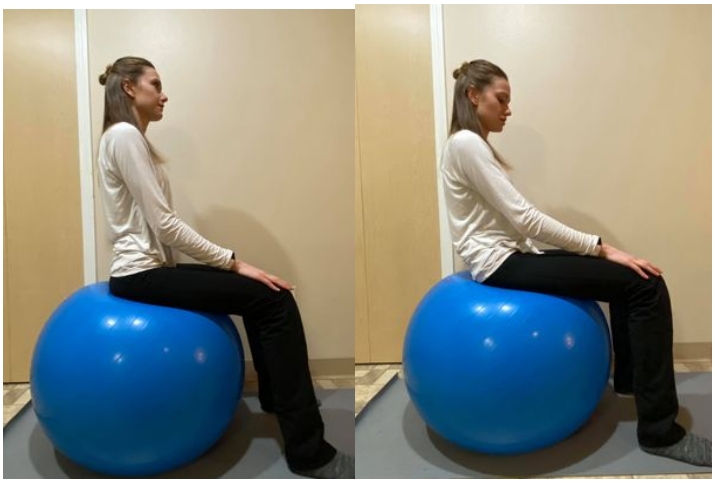
- Pelvic tilting: Begin laying supine with knees flexed and feet on the floor. Pull the belly button down toward the spine and scoop the bottom of the pelvis forward and upward. Hold 5 seconds.

- Pelvic Bridge: See pelvic tilting, lift entire spine excluding the neck off the surface. Hold 5 seconds.

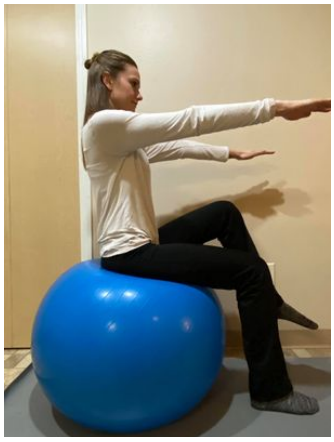
- Cat & Camel: Begin on hands and knees with hands and knees shoulder- and hip- width apart, respectively. Arch the spine upwards, pulling the belly button up towards the spine. Hold 5 seconds. Arch the spine down towards the floor, tightening the back muscles. Hold 5 seconds.

Set 2:

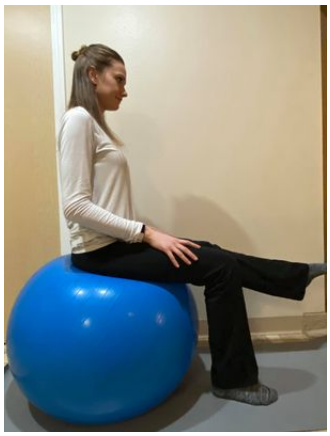
- Swiss ball exercises - adapted from Jeffcoat (2014) and Therapeutic Associates Physical Therapy (2016).
    - Pelvic tilt: Begin seated on exercise ball. Pull the bellybutton inward towards the spine and scoop bottom of the pelvis forward, allowing the ball to roll forward slightly.



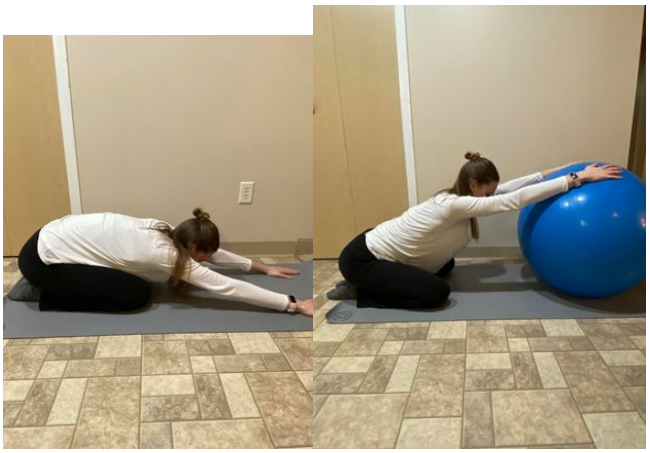
    - Marching: Begin seated on exercise ball. Perform marching motion keeping knees and ankles flexed at 90 degrees by lifting the thigh at the hip.



- Leg extension - Begin seated on exercise ball. Alternate extending knees, kicking feet forward.



- Spinal stretches
  - Child's pose: Begin on hands and knees. Shift hips backward until seated on the feet with arms extended. If the abdomen protrudes and does not allow for full range of motion, use an exercise ball to support the hands and forearms.



- Side-to-side: In standing, keep hips aligned and alternate reaching overhead to the opposite side with the arms. Hold 30 seconds each repetition.

Activity 2: Adaptive Equipment

Activity 2.A: Maternity support belts

Present purchase information for each. Demonstrate proper donning/doffing techniques according to package directions. Allow time for each participant to sample each one.

Examples may include:

Motherhood® Maternity Ultimate Support Belt	Available at select department stores $29.98 March 2021	Takes pressure off belly and back, adjustable Velcro®	Motherhood® Maternity (n.d.).
Maternabelt Secure	Available through medical supply sources $34.99 March 2021	Strong abdominal support for large babies, alleviates low back pain	Flexamed® (2021).
Maternity Support Belt by DJ Orthopedic	Available through medical supply sources $51 - $65 March 2021	Supports the abdomen, distributes weight evenly throughout the spine	Vitality Medical (2021).

* Examples provided above are not exclusive recommendations. Protocol users and participants are encouraged to search for ergonomically sound products that best fit their needs.*

Activity 2.B: Wedge pillows and sleep positioning

Present purchase information for each. Demonstrate proper positioning techniques according to package directions. Allow time for each participant to sample each one.

Examples may include:

Boppy® Pregnancy Wedge	Available at select department stores $16 March 2021	Firm, portable, place under belly or behind back	Boppy® (2021b).
S.O.S (Sleep on Side) Pillow	Available online $79.95 March 2021	Promotes side sleep, supports back and belly, adjustable Velcro®	Belly Bandit® (2021).
Queen Rose Oversize Pregnancy Pillow	Available online $79.99 March 2021	U shaped surround pillow, can position multiple ways, supports hips and belly as well as back	Queen Rose (2021).

Examples provided above are not exclusive recommendations. Protocol users and participants are encouraged to search for ergonomically sound products that best fit their needs.

DISCUSSION

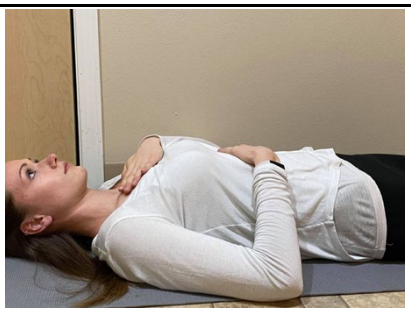
These questions may be asked during the activities or during a formal discussion following the activities, depending on the preference of the presenter and the needs of the group.

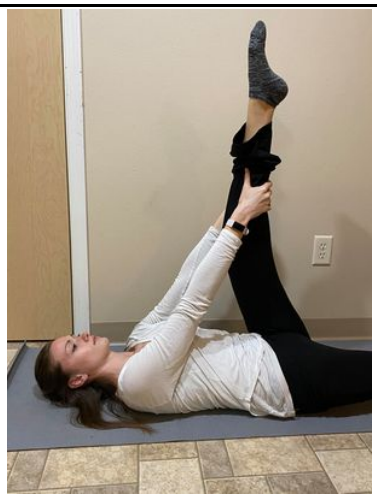
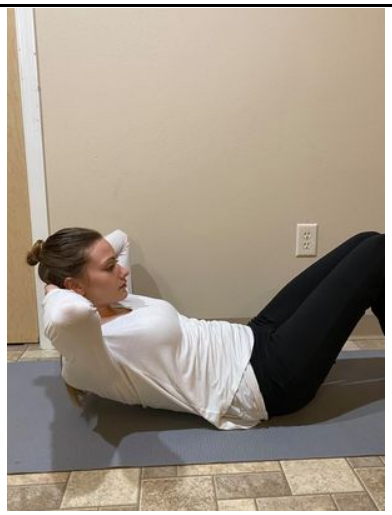
- Sharing
    - What do you think is the functional relationship between posture, movement, and function? Think about pain, performance of activities, joint and muscle movement, and connective tissue.
- Processing
    - How did the graded spinal exercises feel?
    - How do you feel about using the adaptive devices presented?
- Generalization
    - Are these graded spinal exercises do-able in your everyday life?
- Application
    - How would you modify these exercises to be easier or harder to fit your individual needs?
    - How would you use the adaptive devices presented in your daily life?
- Summary
    - Have participants share their most important take-aways.
    - Present and send the summary PDF, located on 29-35.

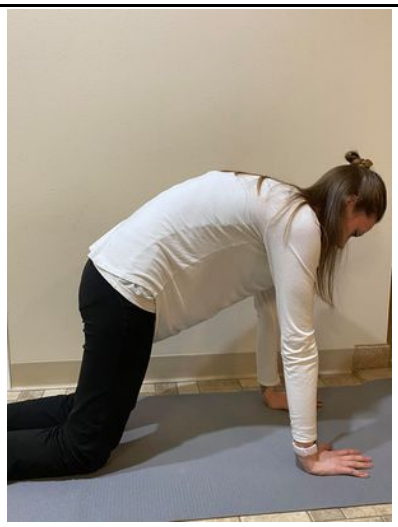
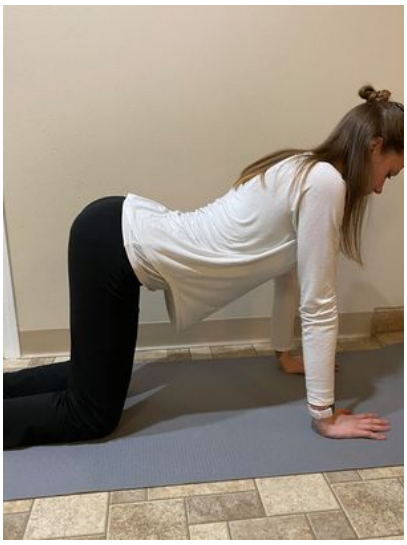
Health Management and Maintenance and Sleep During Pregnancy

GRADED SPINAL EXERCISES: Perform Set 1 five days per week. After one week, or when you feel that Set 1 is no longer challenging, perform Set 1 + Set 2 five days per week. After one week, or when you feel that Set 1 + Set 2 is no longer challenging, increase repetitions, sets, and hold time for each exercise.

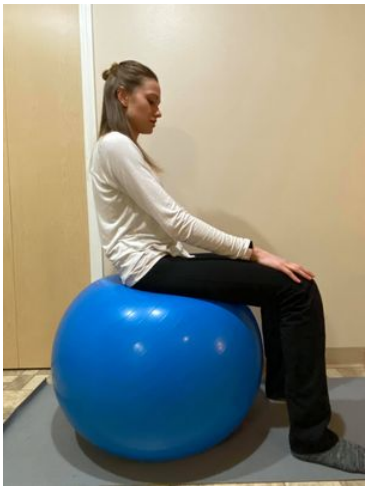
Set 1

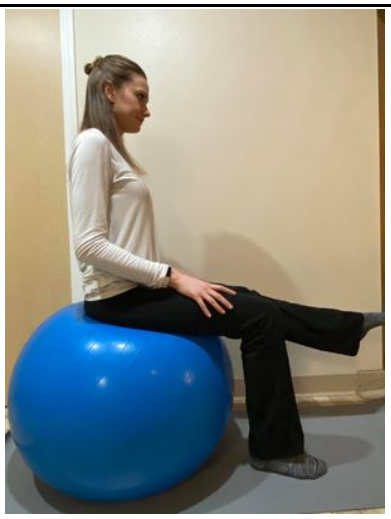
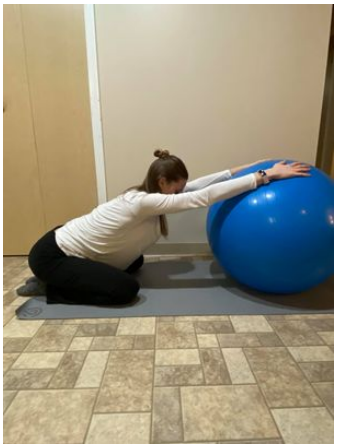
Warm-up – 10 minutes.	
Choice of squats, lunges, standing side bend, hip rotation, forward, backward, or sideways leg lifts, or other light exercise.	
Breathing exercises	
Pursed-lip breathing: Begin seated or laying down. Breathe in through the nose, out through the mouth, as if blowing out a candle. **10 Repetitions**	
Diaphragmatic breathing: Begin laying down supine. Place one hand over the chest, another hand over the belly. Inhale through the nose, exhale through the mouth, focusing on the movement of the hand on your belly. **10 Repetitions**	

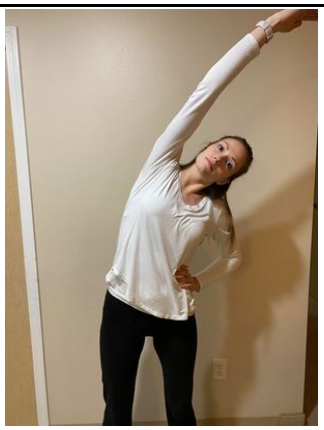
Hip stretching	
Hip extensors stretch: Begin laying down with your legs straight. Lift one leg at the hip. Use your arms to pull your leg towards you. A partner may assist you by pushing the leg towards you. **Hold 5 seconds, relax.**	
Strengthening	
Basic crunches: begin laying down with your knees up and feet on the floor. With hands behind the head and elbows pointing outward, lift the head and shoulders. **Hold 5 seconds. 5 Repetitions**	
Pelvic tilting: Begin laying down with knees up and feet on the floor. Pull the belly button down toward the spine and scoop the bottom of the pelvis forward and upward. **Hold 5 seconds, 3 repetitions.**	

Pelvic Bridge: Begin laying down with knees up and feet on the floor. Lift your hips and entire spine excluding the neck off the floor. **Hold 5 seconds. 5 Repetitions**	
Cat & Camel: Begin on hands and knees with hands and knees shoulder- and hip- width apart, respectively. Arch the spine upwards, pulling the belly button up towards the spine. **Hold 5 seconds**. Arch the spine down towards the floor, tightening the back muscles. **Hold 5 seconds. Complete 8 repetitions.**	 

Set 2

Swiss Ball Exercises	
Pelvic tilt: Begin seated on exercise ball. Pull the bellybutton inward towards the spine and scoop bottom of the pelvis forward, allowing the ball to roll forward slightly. **10 repetitions, 2 sets.**	 
Marching: Begin seated on exercise ball. Perform marching motion. **10 Repetitions, 2 sets**	

Leg extension: Begin seated on exercise ball, kick your feet forward, alternating legs. **10 repetitions, 2 sets**	
Spinal Stretches	
Child's pose: Begin on hands and knees. Shift hips backward until seated on the feet with arms extended. If the abdomen protrudes and does not allow for full range of motion, use an exercise ball to support the hands and forearms. **Hold 30 seconds.**	 

Side-to-side: In standing, keep hips aligned and alternate reaching overhead to the opposite side with the arms. **Hold 30 seconds**	

ADAPTIVE EQUIPMENT: *Examples provided are not exclusive recommendations. Protocol users and participants are encouraged to search for ergonomically sound products that best fit their needs.*

Support belt examples

- Motherhood® Maternity Ultimate Support Belt
- Maternabelt Secure
- Maternity Support Belt by DJ Orthopedic

Sleep positioning product examples

- Boppy® Pregnancy Wedge
- S.O.S. (Sleep on Side) Pillow by Belly Bandit®
- Queen Rose Oversize Pregnancy Pillow

SUMMARY

1. Avoid sleeping or exercising on your back for more than 3 minutes.
2. Avoid excessive stretching.
3. Posture, movement, and function are all inter-related.

Session 1 References

Amazon. (2021b). Emoly Exercise Ball for Yoga, Fitness, Balance, Stability, Extra Thick Professional Grade Balance & Stability Ball – Anti Burst, Workout Program 2020 (Purple, 45 cm). Retrieved March 14, 2021 from https://www.amazon.com/Exercise-Fitness-Balance-Stability-Professional/dp/B07VCCLMZ3/ref=asc_df_B07VCCLMZ3/?tag=&linkCode=df0&hvadid=385179140364&hvpos=&hvnetw=g&hvrand=5980110448334671328&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1021449&hvtargid=pla-823709061515&ref=&adgrpid=82240853201&th=1

Balık, G., Sabri Balık, M., Üstüner, I., Kağıtcı, M., Şahin, F. K., & Güven, E. S. G. (2014). Hand and wrist complaints in pregnancy. *Archives of Gynecology and Obstetrics*, *290*, 479–483. doi:10.1007/s00404-014-3244-2

Belly Bandit®. (2021). One of a Kind: Introducing the Only Doctor-Designed, Must-Have Pregnancy Pillow. Retrieved March 6, 2021 from https://bellybandit.com/pages/sleep-on-side-pregnancy-pillow

Bergbom, I., Modh, C., Lundgren, I., & Lindwall, L. (2017). First-time pregnant women's experiences of their body in early pregnancy. *Scandinavian Journal of Caring Sciences, 31*, 579-586. doi:10.1111/scs.12372

Bey, M. E., Arampatzis, A., & Legerlotz, K. (2018). The effect of a maternity support belt on static stability and posture in pregnant and non-pregnant women. *Journal of biomechanics*, *75*, 123–128. doi:10.1016/j.jbiomech.2018.05.005

Boppy®. (2021b). Boppy® Pregnancy Jersey Wedge. Retrieved March 6, 2021 from https://www.boppy.com/products/boppy-pregnancy-jersey-wedge#:~:text=The%20Boppy®%20Pregnancy%20Wedge%20is%20a%20firm,%20versatile,have%20a%20great%20night's%20sleep%20wherever%20you%20go.

Catena, R.D., Bailey, J.P., Campbell, N., & Music, H.E. (2019). Stand-to-sit kinematic changes during pregnancy correspond with reduced sagittal plane hip motion. *Clinical Biomechanics, 67,* 107-114. doi:10.1016/j.clinbiomech.2019.05.014

Flexamed ®. (2021). Maternabelt - Secure 8" (Strong Maternity Support Belt). Retrieved March 6, 2021 from https://www.flexamed.com/products/maternabelt-secure-strong-maternity-support-belt

incstores.com. (2021). 4'x8'x2" Folding Mats. Retrieved March 14, 2021 from https://www.rubberflooringinc.com/gymnastics-mats.html?slc=2895&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY6B3EB2HsAwcyZCBUNLqKtURTbJd1Q-qNqcMTLwb929dmeiwu7oQSxoCDesQAvD_BwE

Jeffcoat, H. (2014, March 4). International journal of childbirth education: Exercises for lower back pain in pregnancy [Web log post]. Retrieved from https://feminapt.com/resources/published-articles/exercises-for-lower-back-pain-in-pregnancy

Kember, A., Scott, H., O'Brien, L., Borazjani, A., Butler, M., Wells, J., . . . & Morrison, D. (2018). Modifying maternal sleep position in the third trimester of pregnancy with positional therapy: A randomised pilot trial. *British Medical Journal Open, 8*(8). doi:10.1136/bmjopen-2017-020256

Motherhood® Maternity. (n.d.). The Ultimate Maternity Belt. Retrieved on March 6, 2021, from https://www.motherhood.com/collections/maternity-shapewear/products/the-ultimate-maternity-belt-006-97610-006-001

Opala-Berdzik, A., Blaszczyk, J.W., Swider, D., & Cieslinska-Swider, J. (2018). Trunk forward flexion mobility in reference to postural sway in women after delivery: A prospective longitudinal comparison between early pregnancy and 2- and 6-month postpartum follow-ups. *Clinical Biomechanics,56,* 70-74. doi:10.1016/j.clinbiomech.2018.05.009

Queen Rose. (2021). Luxury Long U-Shaped Pregnancy Pillow (Gray). Retrieved March 6, 2021 from https://www.queenrose.com/collections/maternity-pillows/products/u-shaped-long-pregnancy-pillow-gray

Sanders, M.J. & Morse, T. (2005). The ergonomics of caring for children: An exploratory study. *American Journal of Occupational Therapy, 59,* 285-295. doi:10.5014/ajot.59.3.285

Shende, E. & Salunkhe, P. (2020). Effect of graded spinal exercises in postnatal women. *Indian Journal of Physiotherapy and Occupational Therapy, 14*(2). 38-44. Retrieved from http://www.ijpot.com/scripts/IJPOT%20April-June_2020.pdf#page=45

Therapeutic Associates Physical Therapy. (2016, February 4). Pregnancy exercises: Strengthen your pelvic floor, core, and posture [Web log post]. Retrieved from https://www.therapeuticassociates.com/pregnancy-exercises-to-help-strengthen-your-pelvic-floor-core-and-posture-muscles/

Vitality Medical. (2021). Maternity Support Belt by DJ Orthopedic. Retrieved March 6, 2021 from https://www.vitalitymedical.com/ maternity-support-belt-by-djorthopedic.html?feed_special=bing&utm_source=bing&utm_medium=cpc&utm_campaign=**LP%20-%20Shop%20-%20%27Braces-Splints-Supports%27%20-%20(%240-%24100)%20-%20General&utm_term=4581596234241336&utm_content=DJO319S_ea%20%7C%20Maternity%20Support%20Belt%20by%20DJ%20Orthopedic%20Small%203%20-%208%20Inch%20319S%20%7C%20%2433.25

Walmart. (2021a). Mainstays 13 in x 49 in Black Rectangle Door Mirror. Retrieved March 14, 2021 from https://www.walmart.com/ip/Mainstays-13-x-49-Door-Mirror/50110381?wmlspartner=wlpa&selectedSellerId=0&wl13=5806&adid=22222222420&wmlspartner=wmtlabs&wl0=&wl1=g&wl2=c&wl3=501107745824&wl4=pla-293946777986&wl5=1021449&wl6=&wl7=&wl8=&wl9=pla&wl10=8175035&wl11=local&wl12=50110381&wl13=5806&veh=sem_LIA&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY6Vbdl2S1jMMcBiFGpXejn1Q1gIqW-5z2uZVHpqcEAfO--BuyFvByxoCbowQAvD_BwE&gclsrc=aw.ds

Walmart. (2021b). Yoga Mat- Classic Pro Yoga Mat Eco Friendly Non Slip Fitness Exercise Mat – Workout Mat for Yoga, Pilates, and Floor Exercises. Retrieved March 14, 2021 from https://www.walmart.com/ip/Yoga-Mat-Classic-Pro-Yoga-Mat-Eco-Friendly-Non-Slip-Fitness-Exercise-Mat-Workout-Mat-for-Yoga-Pilates-and-Floor-Exercises/138493073?wmlspartner=wlpa&selectedSellerId=101033584&&adid=22222222227364976090&wl0=&wl1=g&wl2=c&wl3=463020006701&wl4=pla-949807804773&wl5=1021449&wl6=&wl7=&wl8=&wl9=pla&wl10=254049223&wl11=online&wl12=138493073&veh=sem&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY7isYblpgdWHg02cA1NQjEsJ-8iW9sVGwmi8lyfQO0_guWGGwHJwhhoCoiYQAvD_BwE&gclsrc=aw.ds

Session 2:
Breastfeeding and Other Baby Care

Background Information for Therapist:

In the second session, the occupations of breastfeeding and other baby care for after birth are addressed. It is suggested that this session be attended by first time pregnant women who are between 6-8 months gestation. Pregnant women who are already mothers as well as one family member or significant other per participant are also welcomed to attend.

The goals for this session are as follows:

1. Participants will verbalize understanding of the importance of the different ways of positioning during breast or bottle feeding.
2. Participants will demonstrate correct positioning throughout different opportunities for breast or bottle feeding.
3. Participants will demonstrate proper positioning for completing other baby cares.

The activities performed in this session are exploring proper ergonomics when completing baby cares as well as breast and bottle feeding. In addition to the contents of this group protocol manual, materials include: yoga mats for each individual or large gym mats to accommodate the group ($10 - $150 each according to incstores.com (2021) and Walmart (2021b)), one or more Boppy® pillows or similar c-shaped pillow ($30 - $50 each according to Boppy® (2021a)), one or more regular pillows (prices vary), one or more long-handled push toys (prices vary), one or more bath kneelers ($25 each according to Amazon (2021a)). The occupational therapist leading the group may also bring any other support pillows depending on availability.

This session is aimed to be completed later in pregnancy to aid in carryover of techniques from the breast and bottle feeding as well as baby care sections. This session also will review techniques covered in the first session and can adapt to better access this stage of pregnancy and meet the changing needs of this population.

The creation of this session was guided by the Person-Environment-Occupation model and the biopsychosocial frame of reference. This session's activities address the person when teaching utilizing the breastfeeding positioners and practicing how to position. The session's activities address the environment when introducing the positioning pillows and adaptive equipment for baby cares. The session addresses occupation when discussing modification of routines and actual practice of breastfeeding and bottle feeding. Ergonomics and the body are heavily emphasized in this session through the focus on proper positioning and lifting techniques. The connections of the participant are addressed by including another in the session and encouraging carryover of skills after birth of the baby. A summary of the PEO transactions and biopsychosocial concepts addressed in this session is found in Table 2.

Table 2

PEO Transactions and Biopsychosocial Concepts in Session 2

	P X E	**E X O**	**P X O**
Bio-	Participants will utilize baby dolls and pillows to simulate breast- and bottle-feeding positioning with therapist feedback on adjustments (Activity 1). Participants will utilize ergonomically sound equipment and environmental modifications to simulate other baby care positioning with therapist feedback on		Participants will demonstrate correct positioning throughout different opportunities for breast or bottle feeding (Goal 2). Participants will demonstrate proper positioning for completing other baby cares (Goal 3).

	adjustments (Activity 2).		
Psycho-	Discussion.	Discussion	Participants will verbalize understanding of the importance of the different ways of positioning during breast- or bottle-feeding (Goal 1). Discussion
Social		Inclusion of a family member promotes carryover of skills into natural contexts.	

Table 2

Delivery of Session 2: INTRODUCTION

Warm-up: Group Introductions

Objective 1: Participants will verbalize understanding of the importance of the different ways of positioning during breast or bottle feeding.

Objective 2: Participants will demonstrate correct positioning throughout different opportunities for breast or bottle feeding.

Objective 3: Participants will demonstrate proper positioning for completing other baby cares.

Background Information for Participants:

It is important to provide education on breastfeeding and positioning to improve baby latch as well as decrease pain and strain on the mother. Natural changes in posture occur during pregnancy, but new mothers who may not be using proper ergonomics related to posture with both breastfeeding and baby care can exacerbate these changes and create a higher biomechanical risk (Sanders & Morse, 2005; Schroeder, 2013). For this reasoning it is important to address these issues to better manage or prevent pain and musculoskeletal conditions such as carpal tunnel syndrome, de quervain's tenosynovitis, and tendinosis of the upper extremity which is found in 21% of mothers (Fernandes, 2018, Sanders & Morse, 2005). Awkward static positioning happens when mothers may stay in one position for longer periods of time during breast feeding or bathing of child (Sanders & Morse, 2005; Schroeder, 2013). It is important to educate and simulate these environments to teach proper positioning to prevent or address these ergonomic issues.

ACTIVITIES

Activity 1: Breast and Bottle Feeding: (Cosimano & Sandhurst, 2011; Fernandes, 2018; Schroeder, 2013; Sri Widiastuti, Rustina, & Efendi, 2020; Surtees & Kelleher, 2011; Westerfield, Koenig, & Oh, 2018).

Utilize baby dolls and pillows to simulate positioning with therapist feedback on adjustments

- Bring the baby to the breast instead of bending to bring the breast to the baby.
- Use pillows to support both the mother and baby in positioning for feeding. The use of pillows to support during breast or bottle feeding, such as the Boppy Pillow or pillows arranged in a similar C-shape can aid in decreasing discomfort and musculoskeletal pain in mothers while feeding their infant
- Proper positioning of the infant and mother reduces nipple pain and improves the infant's latch.
    - Infant facing the mother with infant and mother belly facing each other.
    - Infant's neck in neutral position
    - Nipple pointed towards the roof of the infant's mouth.
- For families that will bottle feed
    - Loose grip on the bottle
    - Keep the wrist in a neutral position and support the baby's weight with stronger joints of the mother's body or pillows.

- Examples of pillows to use while feeding your baby include:

Boppy® Nursing Pillow $30 - $50	More expensive, versatile uses for baby 0-12 months, good positioning	Boppy® (2021a).
Pillows already owned	Cheaper option, more work for positioning, multifunctional	Clinical judgement

Examples provided above are not exclusive recommendations. Protocol users and participants are encouraged to search for ergonomically sound products that best fit their needs.

Activity 2: Other Baby Care

Recommend devices and equipment that support alignment. **Present purchase information and demonstrate the use of each device, allow each participant to practice using each one.**

Examples may include:

Long-handled push-toys Price Varies	Supports parent alignment, allows parent-child play without added stress to parent's body.	Fernandes (2018) Schroeder (2013)
AceRate large bath kneeler with elbow pad set $24.99 March 2021	Prevents soreness of knees and elbows from contact stress when bathing an infant.	Amazon (2021a)

Examples provided above are not exclusive recommendations. Protocol users and participants are encouraged to search for ergonomically sound products that best fit their needs.

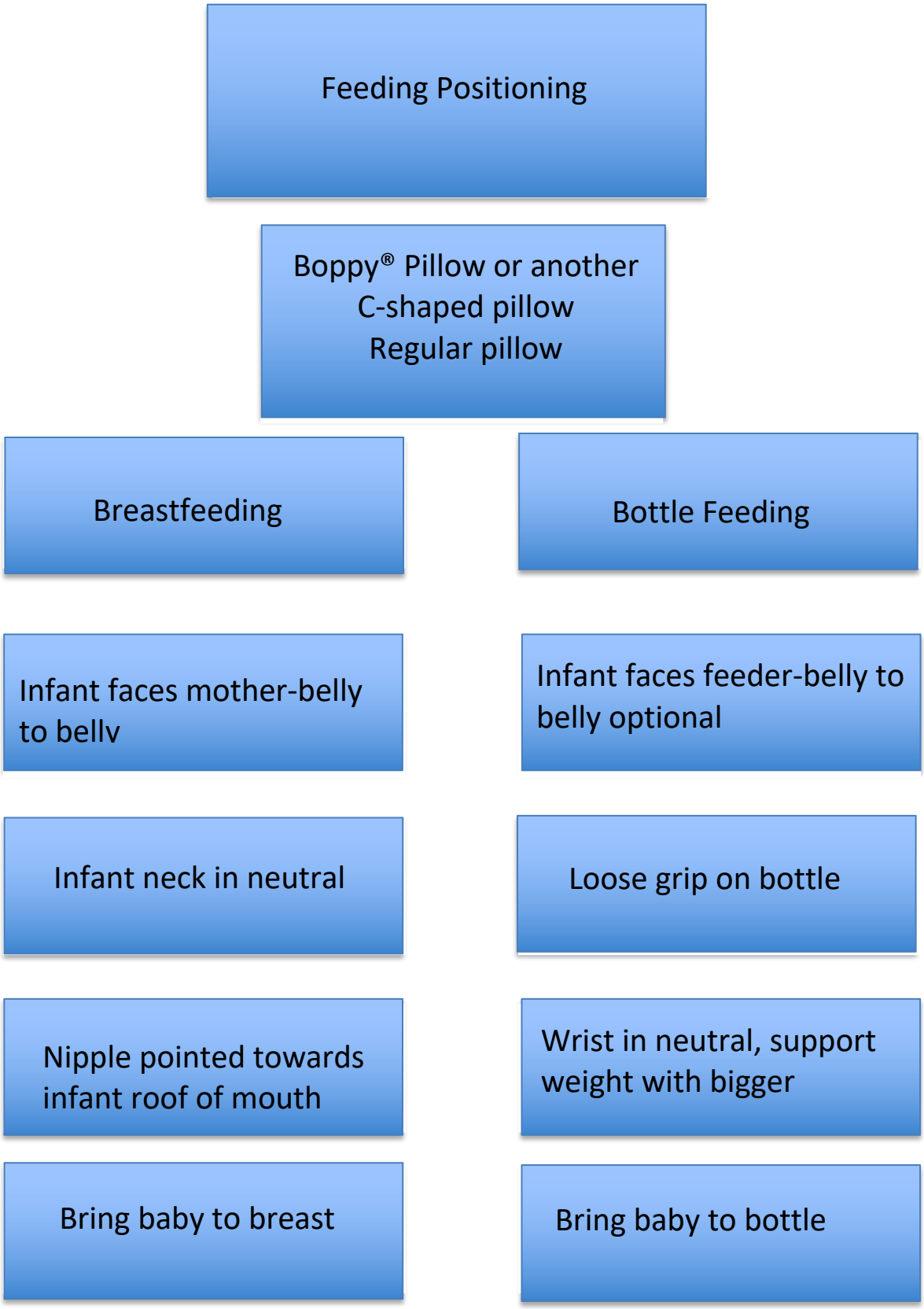
Recommend environmental modifications introduced by Sanders & Morse, (2005) and Fernandes, (2018). **Demonstrate common posture when interacting with an infant on a low vs high surface and interacting with items far from vs close to arms reach. Allow each participant to practice.**

- Arrange the home by changing surface height of objects such as changing tables, cribs, etc. to be at waist level to promote good posture. Look for devices that are adjustable, or sample stationary products before buying them to ensure that they meet your needs.
- Keep all items within arm's reach in standing.

DISCUSSION

These questions may be asked during the activities or during a formal discussion following the activities, depending on the preference of the presenter and the needs of the group.

- Sharing
    - What do you think went well for positioning for feeding?
    - What devices do you like best for positioning yourself for baby care?
- Processing
    - How do you feel in the different positions you trialed?
    - What position do you like best, do you like one pillow over the other?
- Generalization
    - What activities do you do now that may cause a risk due to awkward or non-moving positioning?
    - What activities do you do now that may cause a risk due to forceful exertion?
- Application
    - How could you use this information at home?
    - Where do you see yourself setting up at home for these activities (feeding, changing baby)?
- Summary
    - Have participants share their most important take-aways.
    - Present and send the summary PDF located on pages 92-93.



(Surtees & Kelleher, 2011; Cosimano & Sandhurst., 2011; Schroeder, 2013)

Long-handled push-toys	Supports parent alignment, allows parent-child play without added stress to parent's body.	Fernandes (2018) Schroeder (2013)
Acerate large bath kneeler with elbow pad set	Prevents soreness of knees and elbows from contact stress when bathing an infant.	Amazon (2021a)

Examples provided above are not exclusive recommendations. Protocol users and participants are encouraged to search for ergonomically sound products that best fit their needs.

- Arrange home to have baby items at waist level
- Keep all items within arm's reach in standing

Session 2 References

Amazon. (2021a). AceRate Large Bath Kneeler with Elbow Rest Pad Set, 2 inch Thick Kneeling Pad and Elbow Rest for Knee & Arm Support Large Bathtub Kneeling Mat with Toy Organizer. Retrieved March 6, 2021 from https://www.amazon.com/AceRate-Kneeler-Kneeling-Support-Organizer/dp/B08F9XQGJ9/ref=sr_1_1?dchild=1&keywords=■+Acerate+large+bath+kneeler+with+elbow+pad+set&qid=1615062943&sr=8-1

Boppy®. (2021a). Boppy® Original Feeding & Infant Support Pillow. Retrieved March 6, 2021 from https://www.boppy.com/products/boppy-classic-feeding-infant-support-pillow

Cosimano, A. & Sandhurst, H. (2011). Strategies for successful breastfeeding in the NICU. *Neonatal Network, 30*, 340-343. doi:10.1891/0730-0832.30.5.340

Fernandes, J.G. (2018). Occupational therapists' role in perinatal care: A health promotion approach. *American Journal of Occupational Therapy, 72*(5), 1-4. doi:10.5014/ajot.2018.028126

incstores.com. (2021). 4'x8'x2" Folding Mats. Retrieved March 14, 2021 from https://www.rubberflooringinc.com/gymnastics-mats.html?slc=2895&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY6B3EB2HsAwcyZCBUNLqKtURTbJd1Q-qNqcMTLwb929dmeiwu7oQSxoCDesQAvD_BwE

Sanders, M.J. & Morse, T. (2005). The ergonomics of caring for children: An exploratory study. *American Journal of Occupational Therapy, 59,* 285-295. doi:10.5014/ajot.59.3.285

Schroeder, S.J. (2013). Applying ergonomics principles to the job of baby care. *Work & Industry Special Interest Section Quarterly, 27*(3), 1–4. Bethesda, MD: American Occupational Therapy Association Inc.

Sri Widiastuti, I., Rustina, Y., & Efendi, D. (2020). The use of breastfeeding pillow to reduce discomfort for breastfeeding mothers. *Pediatric reports*, *12*(Suppl 1), 8702. doi:10.4081/pr.2020.8702

Surtees, A., & Kelleher, D. (2011). Maternity focus: Techniques to support breastfeeding. *British Journal of Healthcare Assistants, 5*, 134-136. doi:10.12968/bjha.2011.5.3.134

Walmart. (2021b). Yoga Mat- Classic Pro Yoga Mat Eco Friendly Non Slip Fitness Exercise Mat – Workout Mat for Yoga, Pilates, and Floor Exercises. Retrieved March 14, 2021 from https://www.walmart.com/ip/Yoga-Mat-Classic-Pro-Yoga-Mat-Eco-Friendly-Non-Slip-Fitness-Exercise-Mat-Workout-Mat-for-Yoga-Pilates-and-Floor-Exercises/138493073?wmlspartner=wlpa&selectedSellerId=101033584&&adid=22222222227364976090&wl0=&wl1=g&wl2=c&wl3=463020006701&wl4=pla-949807804773&wl5=1021449&wl6=&wl7=&wl8=&wl9=pla&wl10=254049223&wl11=online&wl12=138493073&veh=sem&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY7isYblpgdWHg02cA1NQjEsJ-8iW9sVGwmi8lyfQO0_guWGGwHJwhhoCoiYQAvD_BwE&gclsrc=aw.ds

Westerfield, K.L., Koenig, K., & Oh, R. (2018). Breastfeeding: Common questions and answers. *American Family Physician, 98*(6), 368-373. Retrieved from https://www-clinicalkey-com.ezproxy.library.und.edu/#!/content/playContent/1-s2.0-S0002838X18303058

Session 3:
Routines, Leisure, and Community Mobility

Background Information for Therapist:

In the third and final session, the occupations and performance patterns of leisure, community mobility, and routines during pregnancy and new motherhood are addressed. It is suggested that this session is attended by pregnant women who are new mothers between 6-8 months gestation. Pregnant women who are already mothers and one family member or significant other per participant are also welcomed to attend.

The goals for this session are as follows:

1. Participants will verbalize understanding of the importance of leisure, community mobility, and routines during pregnancy and new motherhood, as well as the ergonomic risks associated with these occupations in new motherhood.
2. Participants will demonstrate ergonomically correct strategies for community mobility.
3. Participants will identify current or future leisure opportunities to participate in during pregnancy or new motherhood.
4. Participants will evaluate their current routine and improve on it for when the baby arrives.

Community mobility, leisure, and routines are greatly impacted by pregnancy and new motherhood. Community mobility during pregnancy and new motherhood introduces many ergonomic risks to the new mother, including awkward or static positioning, forceful exertion, contact stress, and vibration (Sanders & Morse, 2005; Schroeder, 2013). Awkward or static positioning occurs when carrying the baby in a carrier or on one hip, forceful exertion occurs when lifting or lowering the baby into carriers or while pushing the baby in a stroller (Sanders & Morse, 2005). Pushing the baby in a stroller also exposes the mother to contact stress and vibration in the upper extremities (Schroeder, 2013). Baby care tasks involving high biomechanical risk that often occur during community mobility were significantly associated with greater musculoskeletal dysfunction among parents (Sanders & Morse, 2005). Leisure is an occupation that often gets set aside during pregnancy and new motherhood, but it is important for parents to continue to engage in meaningful activities and outdoor physical activity, as it can promote mental and physical health (Sanders & Morse, 2005). A study by Visser Nel, la Cock, Labuschagne, Lindeque, Malan, & Viljoen (2016) revealed that participation in support groups promoted parent engagement in leisure activities. Pregnancy and new motherhood can negatively affect previously maintained routines and the formation of new routines due to fatigue (Bergbom, Modh, Lundgren, & Lindwall, 2017; Froelich, Donovan, Ravlin, Fortier, North, & Bloch, 2015). Visser et al. (2016) report that it is important for pregnant women and new mothers to feel in control of their time to prevent musculoskeletal pain and discomfort. Occupational therapy intervention can support pregnant women and new mothers to manage new and existing routines by helping new parents to create and adhere to schedules and examine stressors to improve self-efficacy (Visser et al., 2016).

The activities to be performed during this session include trying on various baby carriers and practicing proper ergonomics during their use, exploring alternative strategies for ergonomically stable community mobility, creating support systems, and evaluating current routines. In addition to the contents of this group protocol manual, materials include a variety of baby slings or carriers ($20-$190 each according to Acrabros (2020) and Baby Bjorn (n.d.)), a standard infant car seat ($60-$160 according to Kohl's (2021) and Safety 1st (2021)), and some baby dolls (price varies). The occupational therapy practitioner leading the group may include additional examples of ergonomically designed equipment for community mobility depending on availability, as well as additional resources to support the participants leisure and routines.

This session is meant to occur between 6-8 months gestation because it allows the new mother to learn the ergonomic techniques and considerations for leisure and routines before the arrival of the baby, as the purpose of the program is for prevention of ergonomic issues and promotion of overall well-being of the new mother. This session is intended to provide pregnant women who are new mothers with an accurate understanding of the ergonomic risks and lifestyle changes of new motherhood and equip them with the skills to maintain proper ergonomics and routines throughout their pregnancy and in new motherhood.

The creation of this session was guided by the Person-Environment-Occupation model and the biopsychosocial frame of reference. This session's activities address the environment when discussing the participants' social supports in their social context. The session's activities address the occupation when providing participants with alternative strategies to participate in the occupation of community mobility with a baby, when exploring leisure and social participation opportunities, and when providing strategies for structuring the performance patterns of the participants' occupations. The person's biology is addressed when

targeting the ergonomic risks that can lead to musculoskeletal issues in pregnant women and new mothers. The social connections of the participant are addressed by including family members in the sessions and encouraging them to promote carryover of skills learned in the session throughout the duration of the perinatal period, in addition to when discussing existing social supports and creating a new social network. The psychological aspects of the person are addressed when discussing the participants' satisfaction with their routines and their self-efficacy to use the skills learned during the session in their daily lives. A summary of the PEO transactions and biopsychosocial concepts addressed in this session is found in Table 3.

Table 3
PEO Transactions and Biopsychosocial Concepts in Session 3

	P X E	**E X O**	**P X O**
Bio-	Participants will demonstrate proper use of presented baby carriers and ergonomically sound methods for community mobility with an infant (Activity 1).	Discussion.	Participants will demonstrate ergonomically correct strategies for community mobility (Goal 2).
Psycho-	Discussion	Participants will evaluate how their current routines influence their participation in valued occupations (Activity 3). Discussion	Participants will verbalize understanding of the importance of leisure, community mobility, and routines during pregnancy and new motherhood, as well as the ergonomic risks associated with these occupations in new motherhood (Goal 1).

			Participants will identify current or future leisure opportunities to participate in during pregnancy or new motherhood (Goal 3). Discussion.
Social	Discussion.	Participants will create a support/leisure group (Activity 2) Discussion.	

Table 3

Delivery of Session 3: INTRODUCTION

Warm-up: Group Introductions

Objective 1: Participants will verbalize understanding of the importance of leisure, community mobility, and routines during pregnancy and new motherhood, as well as the ergonomic risks of these occupations in new motherhood.

Objective 2: Participants will demonstrate ergonomically correct strategies for community mobility.

Objective 3: Participants will identify current or future leisure opportunities to participate in during pregnancy or new motherhood.

Objective 4: Participants will evaluate their current routine and improve on it for when the baby arrives.

Background Information for Participants:

- Four ergonomic risk factors are:
    - Awkward/static positioning - like having poor posture or staying in one position for long periods of time
    - Forceful exertion - like lifting something heavy
    - Contact stress - when another object puts pressure on an area of the body
    - Vibration
- Awkward and static positioning often occurs when carrying a baby in a car seat or on your hip (Sanders & Morse, 2005).
- Forceful exertion occurs when lifting or lowering a baby into or out of a car seat or baby carrier, lifting of lowering car seats or baby carriers, or pushing the baby in a stroller (Sanders & Morse, 2005). Forceful exertion is especially harmful to the body when there are rotations or twisting movements of the spine (Schroeder, 2013).
- Contact stress and vibration occur on the mother's hands when pushing a stroller, especially over uneven or rough ground (Schroeder, 2013).
- According to Sanders & Morse (2005), it is important for new mothers' mental and physical health to continue to engage in meaningful activities and outdoor physical activity.
- In a study by Bergbom et al. (2017), pregnant women and new mothers reported difficulty maintaining their routine due to fatigue. This is an alarming finding, as Visser et al. (2016) discovered that to prevent musculoskeletal discomfort and pain in parents, it is important that parents feel that they have control over their time.

ACTIVITIES

Activity 1: Ergonomic considerations for community mobility

Avoid carrying the baby on your hip to prevent twisting of your spine. You may instead try using a baby sling or baby carrier. **Present purchase information for each. Demonstrate proper donning/doffing techniques according to package directions. Allow time for each participant to sample each one.**

Examples may include:

Acrabros Baby Wrap Carrier	Available online $19.99 March 2021	Lightweight, breathable, soft	Acrabros (2020).
Baby Carrier Hipseat Sling by Aiebao	Available online $57.00 March 2021	adjustable, shock absorbing, scratch-resistant	Aiebao Baby Carriers (2020).
Baby Carrier One by Baby Bjorn	Available online $190 March 2021	Versatile for use as your baby grows, comfortable, "hip friendly" (no greater risk for hip dysplasia of the baby)	Baby Bjorn (n.d.).

Examples provided above are not exclusive recommendations. Protocol users and participants are encouraged to search for ergonomically sound products that best fit their needs.

When using baby carriers or slings, it is important to consider each of the following points addressed by Signer (2020). **Demonstrate each ergonomic principle, allow time for each participant to practice.**

- Monitor the baby's temperature
- Read all the directions for the sling/carrier, paying special attention to weight minimums and maximums
- Ease into wearing the sling for longer periods of time, no more than an hour at once.
- When wearing your baby in the front, avoid putting pressure on your low back by keeping your knees relaxed with a slight bend in them, and your low back relaxed. Engage your core by keeping your weight shifted slightly forward.
- When walking while carrying the baby in a sling or carrier, decrease strain to your hips and engage your core by taking smaller steps and leaning forward slightly.
- Avoid twisting of your spine and strain to your arms by carrying your baby's car seat with two hands at the head and feet (Sanders & Morse, 2005; Schroeder, 2013). **Demonstrate this technique. Allow time for each participant to practice using an infant car seat.**
- When you must carry the baby without any devices or equipment, consider the following techniques (Sanders & Morse, 2005; Schroeder, 2013). **Demonstrate each technique. Allow each participant to practice using a baby doll.**
    - Keep the thumb tucked in toward the hand.
    - Keep the wrist in neutral.
    - Support the weight of the baby using larger, stronger joints instead of smaller, weaker joints.

Activity 2: Leisure

Facilitate the creation of a support/leisure group chat on a social media outlet of the group's choosing (ex. Facebook, Instagram, Snapchat, GroupMe, Email, SMS messaging, etc.). Discuss ideas for group leisure opportunities during the remainder of pregnancy and new motherhood.

Activity 3: Routines: Adapted from Davis, Eshelman, & McKay, (2008).
Provide participants with the *Typical Day Timesheet* located on page 110.
Instruct the participants to think about a typical day, and log the activities performed, the amount of time spent engaged in those activities, and any comments they may have about the value or importance of those activities. Questions to facilitate discussion about the activity can be found in the DISCUSSION section.

- Creating and maintaining a positive routine can be facilitated using the following strategies adapted from Davis et al. (2008).
- Be proactive, plan your day, schedule your tasks.
- Schedule tasks according to the time and energy you have. If you are a morning person, schedule your most taxing tasks in the morning. If you feel sleepy after lunchtime, avoid scheduling your taxing tasks in the afternoon.
- Organize your time using a planner, digital calendar, etc.
- Consider your values and priorities when designating time for your activities.

DISCUSSION

These questions may be asked during the activities or during a formal discussion following the activities, depending on the preference of the presenter and the needs of the group.

- Sharing
    - Describe your social support system.
    - Share your *Typical Day Timesheet*
- Processing
    - How do the ergonomically sound postures feel?
    - Are you satisfied with your current routine? Explain.
- Generalization
    - Where in the community would these strategies for transporting the baby be helpful?
    - How else will you use these ergonomic strategies for community mobility in your life?
    - What common themes are there among the group's current routines and the values or priorities attached to them?
- Application
    - How can these ergonomic strategies for community mobility be modified to fit your needs, routine, or abilities?
    - How would you reorganize your routine to better reflect your needs, values, and priorities?
- Summary
    - Have participants share their most important take-aways.
    - Present and send the summary PDF located on page 109.

Routines, Leisure, and Community Mobility for Pregnant Women and New Mothers

BABY SLINGS/CARRIERS: *Examples provided are not exclusive recommendations. Protocol users and participants are encouraged to search for ergonomically sound products that best fit their needs.*

- Acrabros Baby Wrap Carrier
- Baby Carrier Hipseat Sling by Aiebao
- Baby Bjorn Baby Carrier One

When using these and similar products, remember to:

- Monitor the baby's temperature
- Read all the directions, paying special attention to weight minimums and maximums
- Ease into wearing the sling for longer periods of time, no more than an hour at once.
- When wearing your baby in the front, keep your knees relaxed with a slight bend in them, keep your low back relaxed, and keep your weight shifted slightly forward.
- When walking, take smaller steps and lean forward slightly.

When carrying your baby without a sling or carrier, remember to:

- Keep the thumb tucked in toward the hand.
- Keep the wrist straight.
- Support the weight of the baby using larger, stronger joints instead of smaller, weaker joints.

ROUTINES

When beginning a new routine, remember to:

- Plan ahead.
- Schedule tasks according to the time and energy you have.
- Use a planner, digital calendar, etc.
- Consider your values and priorities.

Typical Day Timesheet

Activity	Time	Comments
Waking through lunch		
After lunch through dinner		
After dinner until sleep		

Adapted from Davis et al. (2008).

Session 3 References

Acrabros. (2020). Baby Wrap Carrier, Black. Retrieved March 6. 2021 from https://www.acrabros.com/products/acrabros-baby-wrap-carrier-hands-free-baby-carrier-sling-lightweight-breathable-softness-perfect-for-newborn-infants-and-babies-shower-gift-black?variant=31814815449161

Aiebao Baby Carriers. (2020). Aiebao 6612 Four Seasons 3 in 1 Hipseat Sling. Retrieved March 6, 2021 from https://aiebaobabycarriers.com/product/aiebao-6612-four-seasons-3-in-1-hipseat-sling/

Baby Bjorn. (n.d.). Baby Bjorn Baby Carrier One. Retrieved March 6, 2021 from https://www.babybjorn.com/baby-carriers/baby-carrier-one/?attribute_pa_color=sort&attribute_pa_material=cotton-mix

Bergbom, I., Modh, C., Lundgren, I., & Lindwall, L. (2017). First-time pregnant women's experiences of their body in early pregnancy. *Scandinavian Journal of Caring Sciences, 31*, 579-586. doi:10.1111/scs.12372

Davis, M., Eshelman, E.R. & McKay, M. (2008). *The relaxation & stress reduction workbook: Sixth edition.* Oakland, CA: New Harbinger Publications, Inc

Froelich, J., Donovan, A., Ravlin, E., Fortier, A., North, J., & Bloch, M.K.S. (2015). Daily routines of breastfeeding mothers. *Work, 50*(3), 433-442. doi:10.3233/WOR-141954

Kohl's. (2021). Evenflo Nurture Infant Car Seat. Retrieved March 14, 2021 from https://www.kohls.com/product/prd-2907379/evenflo-nurture-infant-car-seat.jsp?skuid=33835616&CID=shopping15&utm_campaign=EC%20BABY%20NON-APPAREL&utm_medium=CSE&utm_source=google&utm_product=33835616&utm_campaignid=9733267159&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY58THgEoTs44U6lKr06resuIRj23gRmPvbRObizqcSsVQ_KMqzZGshoClF8QAvD_BwE&gclsrc=aw.ds

Safety 1st. (2021). Grow and Go™ All-In-Once Convertible Car Seat. Retrieved March 14, 2021 from https://www.safety1st.com/grow-and-go-all-in-one-convertible-car-seat-cc138-s1-us-en.html?gclid=CjwKCAiAhbeCBhBcEiwAkv2cYzwqb77EgZXdokiXI_oFCr5Py0DAUan4iYFgnb-R2dt9PJYCBELXJRoCGDYQAvD_BwE

Sanders, M.J. & Morse, T. (2005). The ergonomics of caring for children: An exploratory study. *American Journal of Occupational Therapy, 59,* 285-295. doi:10.5014/ajot.59.3.285

Schroeder, S.J. (2013). Applying ergonomics principles to the job of baby care. *Work & Industry Special Interest Section Quarterly, 27*(3), 1–4. Bethesda, MD: American Occupational Therapy Association Inc.

Signer, A. (2020, December 22). Both mom and baby need to have proper posture when using a baby sling [Web log post]. Retrieved from https://www.babygaga.com/motherhood-best-posture-when-using-baby-sling/

Visser, M., Nel, M., la Cock, T., Labuschagne, N., Lindeque, W., Malan, A., & Viljoen, C. (2016). Breastfeeding among mothers in the public health sector: The role of the occupational therapist. *South African Journal of Occupational Therapy, 46*(2), 65-72. doi:10.17159/2310-3833/2016/v46n2a11

Thank You

Thank you for your consideration in the use of this product. We enjoyed our time spent researching best practice in this area as it is identified as an area of need through the gap in literature available. We hope this product can be utilized by multiple sources to provide education and information to pregnant women and their families to help improve ergonomics and aim to avoid the increase or development of different musculoskeletal injuries that are commonly found with pregnancy and poor ergonomics.

We aim to add sessions to this product as our next step in the process of developing this product, and to update and add to the information as research changes and products utilized are further developed.

Product References

Acrabros. (2020). Baby Wrap Carrier, Black. Retrieved March 6. 2021 from https://www.acrabros.com/products/acrabros-baby-wrap-carrier-hands-free-baby-carrier-sling-lightweight-breathable-softness-perfect-for-newborn-infants-and-babies-shower-gift-black?variant=31814815449161

Aiebao Baby Carriers. (2020). Aiebao 6612 Four Seasons 3 in 1 Hipseat Sling. Retrieved March 6, 2021 from https://aiebaobabycarriers.com/product/aiebao-6612-four-seasons-3-in-1-hipseat-sling/

Amazon. (2021a). AceRate Large Bath Kneeler with Elbow Rest Pad Set, 2 inch Thick Kneeling Pad and Elbow Rest for Knee & Arm Support Large Bathtub Kneeling Mat with Toy Organizer. Retrieved March 6, 2021 from https://www.amazon.com/AceRate-Kneeler-Kneeling-Support-Organizer/dp/B08F9XQGJ9/ref=sr_1_1?dchild=1&keywords=■+Acerate+large+bath+kneeler+with+elbow+pad+set&qid=1615062943&sr=8-1

Amazon. (2021b). Emoly Exercise Ball for Yoga, Fitness, Balance, Stability, Extra Thick Professional Grade Balance & Stability Ball – Anti Burst, Workout Program 2020 (Purple, 45 cm). Retrieved March 14, 2021 from https://www.amazon.com/Exercise-Fitness-Balance-Stability-Professional/dp/B07VCCLMZ3/ref=asc_df_B07VCCLMZ3/?tag=&linkCode=df0&hvadid=385179140364&hvpos=&hvnetw=g&hvrand=5980110448334671328&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1021449&hvtargid=pla-823709061515&ref=&adgrpid=82240853201&th=1

Baby Bjorn. (n.d.). Baby Bjorn Baby Carrier One. Retrieved March 6, 2021 from https://www.babybjorn.com/baby-carriers/baby-carrier-one/?attribute_pa_color=sort&attribute_pa_material=cotton-mix

Balık, G., Sabri Balık, M., Üstüner, I., Kağıtcı, M., Şahin, F. K., & Güven, E. S. G. (2014). Hand and wrist complaints in pregnancy. *Archives of Gynecology and Obstetrics*, *290*, 479–483. doi:10.1007/s00404-014-3244-2

Belly Bandit®. (2021). One of a Kind: Introducing the Only Doctor-Designed, Must-Have Pregnancy Pillow. Retrieved March 6, 2021 from https://bellybandit.com/pages/sleep-on-side-pregnancy-pillow

Bergbom, I., Modh, C., Lundgren, I., & Lindwall, L. (2017). First-time pregnant women's experiences of their body in early pregnancy. *Scandinavian Journal of Caring Sciences, 31*, 579-586. doi:10.1111/scs.12372

Bey, M. E., Arampatzis, A., & Legerlotz, K. (2018). The effect of a maternity support belt on static stability and posture in pregnant and non-pregnant women. *Journal of biomechanics*, *75*, 123–128. doi:10.1016/j.jbiomech.2018.05.005

Boppy®. (2021a). Boppy® Original Feeding & Infant Support Pillow. Retrieved March 6, 2021 from https://www.boppy.com/products/boppy-classic-feeding-infant-support-pillow

Boppy®. (2021b). Boppy® Pregnancy Jersey Wedge. Retrieved March 6, 2021 from https://www.boppy.com/products/boppy-pregnancy-jersey-wedge#:~:text=The%20Boppy®%20Pregnancy%20Wedge%20is%20a%20firm,%20versatile,have%20a%20great%20night's%20sleep%20wherever%20you%20go.

Catena, R.D., Bailey, J.P., Campbell, N., & Music, H.E. (2019). Stand-to-sit kinematic changes during pregnancy correspond with reduced sagittal plane hip motion. *Clinical Biomechanics, 67,* 107-114. doi:10.1016/j.clinbiomech.2019.05.014

Cosimano, A. & Sandhurst, H. (2011). Strategies for successful breastfeeding in the NICU. *Neonatal Network, 30*, 340-343. doi:10.1891/0730-0832.30.5.340

Davis, M., Eshelman, E.R. & McKay, M. (2008). *The relaxation & stress reduction workbook: Sixth edition.* Oakland, CA: New Harbinger Publications, Inc

Engel, G.L. (1977). The need for a new medical model: A challenge for biomedicine. *Science New Series, 196*(4286), 129-136. Retrieved from http://www.jstor.org/stable/1743658

Fernandes, J.G. (2018). Occupational therapists' role in perinatal care: A health promotion approach. *American Journal of Occupational Therapy, 72*(5), 1-4. doi:10.5014/ajot.2018.028126

Flexamed ®. (2021). Maternabelt - Secure 8" (Strong Maternity Support Belt). Retrieved March 6, 2021 from https://www.flexamed.com/products/maternabelt-secure-strong-maternity-support-belt

Froelich, J., Donovan, A., Ravlin, E., Fortier, A., North, J., & Bloch, M.K.S. (2015). Daily routines of breastfeeding mothers. *Work, 50*(3), 433-442. doi:10.3233/WOR-141954

incstores.com. (2021). 4’x8’x2” Folding Mats. Retrieved March 14, 2021 from https://www.rubberflooringinc.com/gymnastics-mats.html?slc=2895&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY6B3EB2HsAwcyZCBUNLqKtURTbJd1Q-qNqcMTLwb929dmeiwu7oQSxoCDesQAvD_BwE

Jeffcoat, H. (2014, March 4). International journal of childbirth education: Exercises for lower back pain in pregnancy [Web log post]. Retrieved from https://feminapt.com/resources/published-articles/exercises-for-lower-back-pain-in-pregnancy

Kember, A., Scott, H., O’Brien, L., Borazjani, A., Butler, M., Wells, J., . . . & Morrison, D. (2018). Modifying maternal sleep position in the third trimester of pregnancy with positional therapy: A randomised pilot trial. *British Medical Journal Open, 8*(8). doi:10.1136/bmjopen-2017-020256

Kohl’s. (2021). Evenflo Nurture Infant Car Seat. Retrieved March 14, 2021 from https://www.kohls.com/product/prd-2907379/evenflo-nurture-infant-car-seat.jsp?skuid=33835616&CID=shopping15&utm_campaign=EC%20BABY%20NON-APPAREL&utm_medium=CSE&utm_source=google&utm_product=33835616&utm_campaignid=9733267159&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY58THgEoTs44U6lKr06resuIRj23gRmPvbRObizqcSsVQ_KMqzZGshoClF8QAvD_BwE&gclsrc=aw.ds

Law, M., Cooper, B., Strong, S., Stewart, D., Rigby, P., & Letts, L. (1996). The Person–Environment–Occupation model: A transactive approach to occupational performance. *Canadian Journal of Occupational Therapy*, *63*, 9–23. doi:10.1177/000841749606300103

Motherhood® Maternity. (n.d.). The Ultimate Maternity Belt. Retrieved on March 6, 2021, from https://www.motherhood.com/collections/maternity-shapewear/products/the-ultimate-maternity-belt-006-97610-006-001

Opala-Berdzik, A., Blaszczyk, J.W., Swider, D., & Cieslinska-Swider, J. (2018). Trunk forward flexion mobility in reference to postural sway in women after delivery: A prospective longitudinal comparison between early pregnancy and 2- and 6-month postpartum follow-ups. *Clinical Biomechanics,56,* 70-74. doi:10.1016/j.clinbiomech.2018.05.009

Pixabay. (2017). [Pregnant woman silhouette]. Retrieved March 6, 2021 from https://cdn.pixabay.com/photo/2017/09/16/22/25/pregnancy-2757032__340.png

Pregnancy Statistics. (2009). Pregnancy Statistics [Webpage]. Retrieved from http://www.pregnancystatistics.org/content/pregnancy-statistics.html

Queen Rose. (2021). Luxury Long U-Shaped Pregnancy Pillow (Gray). Retrieved March 6, 2021 from https://www.queenrose.com/collections/maternity-pillows/products/u-shaped-long-pregnancy-pillow-gray

Safety 1st. (2021). Grow and Go™ All-In-Once Convertible Car Seat. Retrieved March 14, 2021 from https://www.safety1st.com/grow-and-go-all-in-one-convertible-car-seat-cc138-s1-us-en.html?gclid=CjwKCAiAhbeCBhBcEiwAkv2cYzwqb77EgZXdokiXI_oFCr5Py0DAUan4iYFgnb-R2dt9PJYCBELXJRoCGDYQAvD_BwE

Sanders, M.J. & Morse, T. (2005). The ergonomics of caring for children: An exploratory study. *American Journal of Occupational Therapy, 59,* 285-295. doi:10.5014/ajot.59.3.285

Schroeder, S.J. (2013). Applying ergonomics principles to the job of baby care. *Work & Industry Special Interest Section Quarterly, 27*(3), 1–4. Bethesda, MD: American Occupational Therapy Association Inc.

Shende, E. & Salunkhe, P. (2020). Effect of graded spinal exercises in postnatal women. *Indian Journal of Physiotherapy and Occupational Therapy, 14*(2). 38-44. Retrieved from http://www.ijpot.com/scripts/IJPOT%20April-June_2020.pdf#page=45

Signer, A. (2020, December 22). Both mom and baby need to have proper posture when using a baby sling [Web log post]. Retrieved from https://www.babygaga.com/motherhood-best-posture-when-using-baby-sling/

Sri Widiastuti, I., Rustina, Y., & Efendi, D. (2020). The use of breastfeeding pillow to reduce discomfort for breastfeeding mothers. *Pediatric reports*, *12*(Suppl 1), 8702. doi:10.4081/pr.2020.8702

Surtees, A., & Kelleher, D. (2011). Maternity focus: Techniques to support breastfeeding. *British Journal of Healthcare Assistants, 5*, 134-136. doi:10.12968/bjha.2011.5.3.134

The Noun Project. (n.d.). [Baby carrier silhouette]. Retrieved March 6, 2021 from https://static.thenounproject.com/png/498067-200.png

Therapeutic Associates Physical Therapy. (2016, February 4). Pregnancy exercises: Strengthen your pelvic floor, core, and posture [Web log post]. Retrieved from https://www.therapeuticassociates.com/pregnancy-exercises-to-help-strengthen-your-pelvic-floor-core-and-posture-muscles/

Visser, M., Nel, M., la Cock, T., Labuschagne, N., Lindeque, W., Malan, A., & Viljoen, C. (2016). Breastfeeding among mothers in the public health sector: The role of the occupational therapist. *South African Journal of Occupational Therapy, 46*(2), 65-72. doi:10.17159/2310-3833/2016/v46n2a11

Vitality Medical. (2021). Maternity Support Belt by DJ Orthopedic. Retrieved March 6, 2021 from https://www.vitalitymedical.com/ maternity-support-belt-by-djorthopedic.html?feed_special=bing&utm_source=bing&utm_medium=cpc&utm_campaign=**LP%20-%20Shop%20-%20%27Braces-Splints-Supports%27%20-%20(%240-%24100)%20-%20General&utm_term=4581596234241336&utm_content=DJO319S_ea%20%7C%20Maternity%20Support%20Belt%20by%20DJ%20Orthopedic%20Small%203%20-%208%20Inch%20319S%20%7C%20%2433.25

Walmart. (2021a). Mainstays 13 in x 49 in Black Rectangle Door Mirror. Retrieved March 14, 2021 from https://www.walmart.com/ip/Mainstays-13-x-49-Door-Mirror/50110381?wmlspartner=wlpa&selectedSellerId=0&wl13=5806&adid=22222222420&wmlspartner=wmtlabs&wl0=&wl1=g&wl2=c&wl3=501107745824&wl4=pla-293946777986&wl5=1021449&wl6=&wl7=&wl8=&wl9=pla&wl10=8175035&wl11=local&wl12=50110381&wl13=5806&veh=sem_LIA&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY6Vbdl2S1jMMcBiFGpXejn1Q1gIqW-5z2uZVHpqcEAfO--BuyFvByxoCbowQAvD_BwE&gclsrc=aw.ds

Walmart. (2021b). Yoga Mat- Classic Pro Yoga Mat Eco Friendly Non Slip Fitness Exercise Mat – Workout Mat for Yoga, Pilates, and Floor Exercises. Retrieved March 14, 2021 from https://www.walmart.com/ip/Yoga-Mat-Classic-Pro-Yoga-Mat-Eco-Friendly-Non-Slip-Fitness-Exercise-Mat-Workout-Mat-for-Yoga-Pilates-and-Floor-Exercises/138493073?wmlspartner=wlpa&selectedSellerId=101033584&&adid=22222222227364976090&wl0=&wl1=g&wl2=c&wl3=463020006701&wl4=pla-949807804773&wl5=1021449&wl6=&wl7=&wl8=&wl9=pla&wl10=254049223&wl11=online&wl12=138493073&veh=sem&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY7isYblpgdWHg02cA1NQjEsJ-8iW9sVGwmi8lyfQO0_guWGGwHJwhhoCoiYQAvD_BwE&gclsrc=aw.ds

Westerfield, K.L., Koenig, K., & Oh, R. (2018). Breastfeeding: Common questions and answers. *American Family Physician, 98*(6), 368-373. Retrieved from https://www-clinicalkey-com.ezproxy.library.und.edu/#!/content/playContent/1-s2.0-S0002838X18303058

Appendix A

Satisfaction Survey

Please complete the following survey one month after the birth of your baby. Responses can be sent via email to mandy.meyer@und.edu.

Please respond to each question by circling your rating on a scale of 1-5

1. Overall, how satisfied were you with your experience participating in the program?

1 2 3 4 5

Comments:

2. To what extent did you benefit from understanding typical body changes during pregnancy?

1 2 3 4 5

Comments:

3. To what extent did participation in the graded spinal exercise program promote good posture and reduce pain?

1 2 3 4 5

Comments:

4. How useful was the exposure to and trial of various ergonomic equipment including postural support belts and sleep positioning aids, breastfeeding pillows and baby care products, and baby carriers?

1 2 3 4 5

Comments:

5. To what extent have you benefitted from understanding and practicing the different ergonomic techniques for feeding, baby care, and carrying your baby presented in the program?

1 2 3 4 5

Comments:

8. To what extent have you benefitted from addressing leisure and routines during the program?

1 2 3 4 5

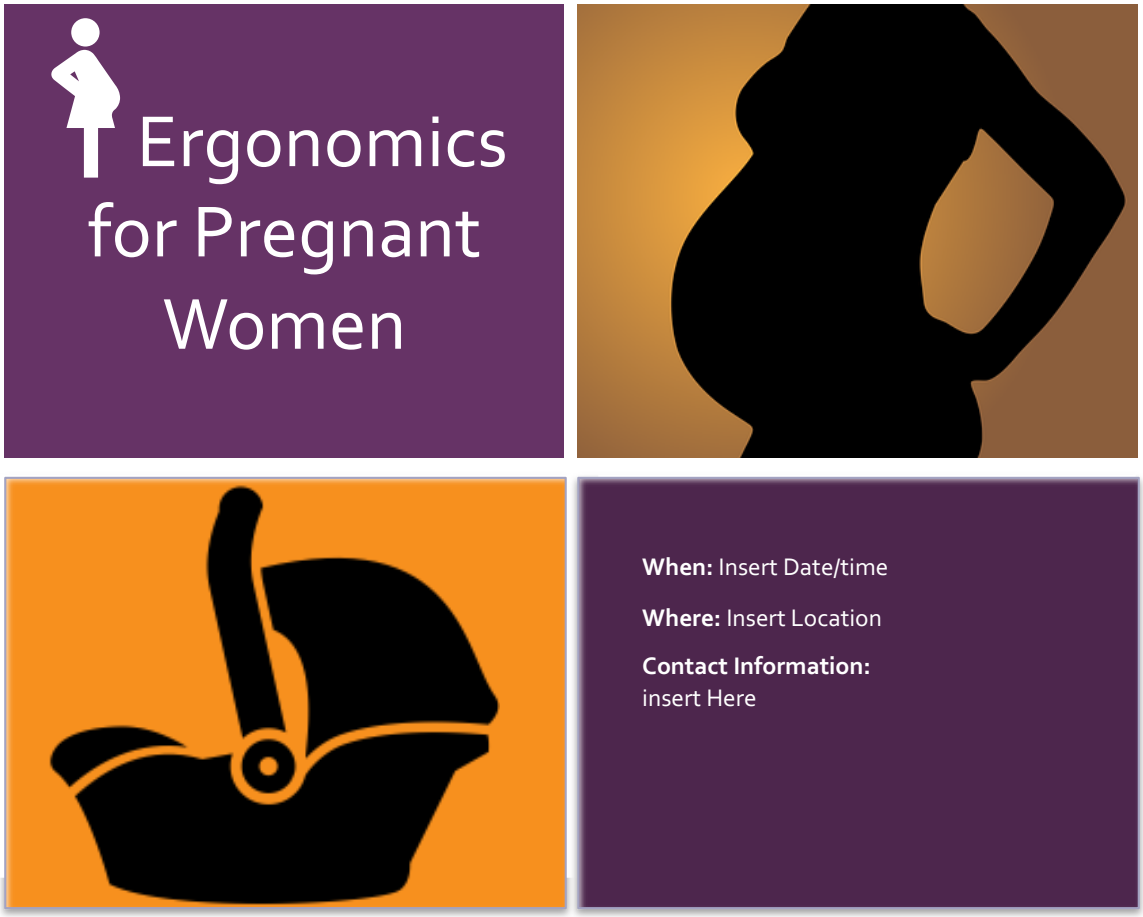
Comments:

9. Are there any other topics that would have been useful to learn about daily life during pregnancy and the postpartum period? Please describe:

Thank you for your participation in the *Ergonomics for Pregnant Women* program and your survey response.

Appendix B

Promotional Flyer



The Noun Project (n.d.) Pixabay (2017)

CHAPTER V

SUMMARY

Through completion of a literature review, it has been found that there is currently a lack of occupational therapists working with pregnant women and after the birth of their child. The literature supports the need for mothers-to-be and new mothers to receive education and training on multiple areas of daily life, and occupational therapy is able to address this need. While there is supportive literature about the needs of this population, there is a gap in literature and research from the occupational therapy standpoint and area of expertise, which raises the need for advocacy in the role that occupational therapy can have in pregnancy and working with pregnant women and their families.

The scholarly project authors developed a group class education protocol for pregnant women to address the needs that are currently within the occupational therapy scope of practice and are not currently being addressed. This protocol was developed to be delivered by an occupational therapist to help educate mothers and their families about ergonomic conditions that can arise from pregnancy and new baby care as the pregnancy progresses, so the information is relevant and well-received at each class session. The authors also developed PDF's that can be both printed and emailed to the participants to reinforce learning and improve carryover of techniques taught in the class. The aim of this product is to provide support to new and expecting mothers along with their support systems in their daily lives and ease some areas of difficulty that are commonly experienced. While the product and handouts address gaps and areas of need for this population, there are some limitations.

Limitations

1. There is a lack of abundant occupational therapy written research and literature on this specific topic. Occupational therapy's role in pregnancy and working with new mothers continues to be an emerging area of practice.
2. The product only contains three sessions of information. The sessions provided in this product cover what the developers and advisor viewed as the most pertinent information to provide to this population and were guided by the research and literature review. This product can be expanded as occupational therapy develops more research on this topic as well as gains more traction in this area of practice.
3. The authors of this product have not yet experienced pregnancy or child rearing of their own children at this point in time. While the developers have had experience with infants in clinical scenarios and in their personal lives, the lack of experience of pregnancy and full-time caregiving and the demands that follow are a limitation. The developers discussed ideas and information with women who have experienced pregnancy and caregiving to gain more insight.

Recommendations

1. The product developers created a satisfaction survey for group participants to provide feedback that can be used to improve the program moving forward. The authors recommend that this product continue to expand as more information is gained on the role of occupational therapy in this area of practice and recommendations and feedback are received from the survey provided to the participants.

2. The authors of this product also recommend that it be implemented in multiple areas of care including outside of the hospital setting to apply to a larger population of pregnant women and new mothers.
3. The authors recommend that research be conducted after the first trials of the product to examine efficacy of the product, as this is a new and currently untested product.

Thank you

We would like to first off thank Dr. Mandy Meyer for all of her support, feedback, and wisdom during the entire process of developing this product. Her insight into all areas was both well received and instrumental in the success of this development. We also would like to thank our families for providing both mental and physical support during this development and answering any questions or concerns that they could.

REFERENCES

Abissulo, C.M.F., Silvino, Z.R., & Ferriera, H.C. (2016). Validation of realistic simulators used for breastfeeding guidance: A quasi-experimental study. *Online Brazilian Journal of Nursing, 15*(4), 599-604. doi:10.17665/1676-4285.20165345

Acrabros. (2020). Baby Wrap Carrier, Black. Retrieved March 6. 2021 from https://www.acrabros.com/products/acrabros-baby-wrap-carrier-hands-free-baby-carrier-sling-lightweight-breathable-softness-perfect-for-newborn-infants-and-babies-shower-gift-black?variant=31814815449161

Aiebao Baby Carriers. (2020). Aiebao 6612 Four Seasons 3 in 1 Hipseat Sling. Retrieved March 6, 2021 from https://aiebaobabycarriers.com/product/aiebao-6612-four-seasons-3-in-1-hipseat-sling/

Amazon. (2021a). AceRate Large Bath Kneeler with Elbow Rest Pad Set, 2 inch Thick Kneeling Pad and Elbow Rest for Knee & Arm Support Large Bathtub Kneeling Mat with Toy Organizer. Retrieved March 6, 2021 from https://www.amazon.com/AceRate-Kneeler-Kneeling-Support-Organizer/dp/B08F9XQGJ9/ref=sr_1_1?dchild=1&keywords=■+Acerate+large+bath+kneeler+with+elbow+pad+set&qid=1615062943&sr=8-1

Amazon. (2021b). Emoly Exercise Ball for Yoga, Fitness, Balance, Stability, Extra Thick Professional Grade Balance & Stability Ball – Anti Burst, Workout Program 2020 (Purple, 45 cm). Retrieved March 14, 2021 from https://www.amazon.com/Exercise-Fitness-Balance-Stability-Professional/dp/B07VCCLMZ3/ref=asc_df_B07VCCLMZ3/?tag=&linkCode=df0&hvadid=385179140364&hvpos=&hvnetw=g&hvrand=5980110448334671328&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1021449&hvtargid=pla-823709061515&ref=&adgrpid=82240853201&th=1

American Occupational Therapy Association. (2020a). AOTA unveils Vision 2025 [Webpage]. Retrieved from https://www.aota.org/AboutAOTA/vision-2025.aspx

American Occupational Therapy Association. (2020b). What is occupational therapy? [Webpage]. Retrieved from https://www.aota.org/Conference-Events/OTMonth/what-is-OT.aspx

American Occupational Therapy Association. (2017). Occupational therapy's role with ergonomics [Factsheet]. Retrieved from https://www.aota.org/~/media/Corporate/Files/AboutOT/Professionals/WhatIsOT/WI/Facts/ergonomics.pdf

American Occupational Therapy Association. (2014). Occupational therapy practice framework: Domain and process. *American Journal of Occupational Therapy, 68*(1), S1-S48. doi:10.5014/ajot.2014.682006

Baby Bjorn. (n.d.). Baby Bjorn Baby Carrier One. Retrieved March 6, 2021 from https://www.babybjorn.com/baby-carriers/baby-carrier-one/?attribute_pa_color=sort&attribute_pa_material=cotton-mix

Balık, G., Sabri Balık, M., Üstüner, I., Kağıtcı, M., Şahin, F. K., & Güven, E. S. G. (2014). Hand and wrist complaints in pregnancy. *Archives of Gynecology and Obstetrics*, *290*, 479–483. doi:10.1007/s00404-014-3244-2

Belly Bandit®. (2021). One of a Kind: Introducing the Only Doctor-Designed, Must-Have Pregnancy Pillow. Retrieved March 6, 2021 from https://bellybandit.com/pages/sleep-on-side-pregnancy-pillow

Bergbom, I., Modh, C., Lundgren, I., & Lindwall, L. (2017). First-time pregnant women's experiences of their body in early pregnancy. *Scandinavian Journal of Caring Sciences, 31*, 579-586. doi:10.1111/scs.12372

Bey, M. E., Arampatzis, A., & Legerlotz, K. (2018). The effect of a maternity support belt on static stability and posture in pregnant and non-pregnant women. *Journal of biomechanics*, *75*, 123–128. Retrieved from https://doi-org.ezproxylr.med.und.edu/10.1016/j.jbiomech.2018.05.005

Borg-Stein, J., & Dugan, S. A. (2007). Musculoskeletal disorders of pregnancy, delivery and postpartum. *Physical Medicine and Rehabilitation Clinics of North America*, *18*, 459–476. doi:10.1016/j.pmr.2007.05.005

Boppy®. (2021a). Boppy® Original Feeding & Infant Support Pillow. Retrieved March 6, 2021 from https://www.boppy.com/products/boppy-classic-feeding-infant-support-pillow

Boppy®. (2021b). Boppy® Pregnancy Jersey Wedge. Retrieved March 6, 2021 from https://www.boppy.com/products/boppy-pregnancy-jersey-wedge#:~:text=The%20Boppy®%20Pregnancy%20Wedge%20is%20a%20firm,%20versatile,have%20a%20great%20night's%20sleep%20wherever%20you%20go.

Carreiro, J.A., Francisco, A.A., Abrão, A.C.F.V., Marcacine, K.O., Abuchaim, E.S.V., & Coca, K.P. (2018). Breastfeeding difficulties: Analysis of a service specialized in breastfeeding. *Acta Paulista de Enfermagem, 31*(4), 430-438. doi:10.1590/1982- 0194201800060

Catena, R.D., Bailey, J.P., Campbell, N., & Music, H.E. (2019). Stand-to-sit kinematic changes during pregnancy correspond with reduced sagittal plane hip motion. *Clinical Biomechanics, 67,* 107-114. doi:10.1016/j.clinbiomech.2019.05.014

Cosimano, A. & Sandhurst, H. (2011). Strategies for successful breastfeeding in the NICU. *Neonatal Network, 30*, 340-343. doi:10.1891/0730-0832.30.5.340

Davis, M., Eshelman, E.R. & McKay, M. (2008). *The relaxation & stress reduction workbook: Sixth edition.* Oakland, CA: New Harbinger Publications, Inc

Degefa, N., Tariku, B., Bancha, T., Amana, G., Hajo, A., Kusse, Y,. . . . & Aschalew, Z. (2019). Breast Feeding Practice: Positioning and Attachment during Breast Feeding among Lactating Mothers Visiting Health Facility in Areka Town, Southern Ethiopia. *International journal of pediatrics*, *2019*. doi:10.1155/2019/8969432

Engel, G.L. (1977). The need for a new medical model: A challenge for biomedicine. *Science New Series, 196*(4286), 129-136. Retrieved from http://www.jstor.org/stable/1743658

Fernandes, J.G. (2018). Occupational therapists' role in perinatal care: A health promotion approach. *American Journal of Occupational Therapy, 72*(5), 1-4. doi:10.5014/ajot.2018.028126

Flexamed ®. (2021). Maternabelt - Secure 8" (Strong Maternity Support Belt). Retrieved March 6, 2021 from https://www.flexamed.com/products/maternabelt-secure-strong-maternity-support-belt

Froelich, J., Donovan, A., Ravlin, E., Fortier, A., North, J., & Bloch, M.K.S. (2015). Daily routines of breastfeeding mothers. *Work, 50*(3), 433-442. doi:10.3233/WOR-141954

Graham, F., Rodger, S., & Ziviani, J. (2013). Effectiveness of occupational performance coaching in improving children's and mothers' performance and mother's self-competence. *American Journal of Occupational Therapy, 67,* 10-18. doi:10.5014/ajot.2013.00648

incstores.com. (2021). 4'x8'x2" Folding Mats. Retrieved March 14, 2021 from https://www.rubberflooringinc.com/gymnastics-mats.html?slc=2895&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY6B3EB2HsAwcyZCBUNLqKtURTbJd1Q-qNqcMTLwb929dmeiwu7oQSxoCDesQAvD_BwE

International Ergonomics Association. (n.d.). Human factors/ergonomics (HF/E) [Webpage]. Retrieved from https://iea.cc/what-is-ergonomics/

Jeffcoat, H. (2014, March 4). International journal of childbirth education: Exercises for lower back pain in pregnancy [Web log post]. Retrieved from https://feminapt.com/resources/published-articles/exercises-for-lower-back-pain-in-pregnancy

Kaux, J. F., Forthomme, B., Goff, C. L., Crielaard, J. M., & Croisier, J. L. (2011). Current opinions on tendinopathy. *Journal of Sports Science and Medicine*, *10*(2), 238–253. Retrieved from https://www.researchgate.net/publication/258036011_Current_Opinions_on_Tendinopathy

Kember, A., Scott, H., O'Brien, L., Borazjani, A., Butler, M., Wells, J., . . . & Morrison, D. (2018). Modifying maternal sleep position in the third trimester of pregnancy with positional therapy: A randomised pilot trial. *British Medical Journal Open, 8*(8). doi:10.1136/bmjopen-2017-020256

Kent, J.C., Ashton, E., Hardwick, C.M. Rowan, M., Chia, E., Fairclough, K, . . . & Geddes, D. (2015). Nipple pain in breastfeeding mothers: Incidence, causes and treatments. *International Journal of Environmental Research and Public Health, 12*, 12247-12263. doi:10.3390/ijerph121012247

Kohl's. (2021). Evenflo Nurture Infant Car Seat. Retrieved March 14, 2021 from https://www.kohls.com/product/prd-2907379/evenflo-nurture-infant-car-seat.jsp?skuid=33835616&CID=shopping15&utm_campaign=EC%20BABY%20NON-APPAREL&utm_medium=CSE&utm_source=google&utm_product=33835616&utm_campaignid=9733267159&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY58THgEoTs44U6lKr06resuIRj23gRmPvbRObizqcSsVQ_KMqzZGshoClF8QAvD_BwE&gclsrc=aw.ds

Law, M., Cooper, B., Strong, S., Stewart, D., Rigby, P., & Letts, L. (1996). The Person–Environment–Occupation model: A transactive approach to occupational performance. *Canadian Journal of Occupational Therapy*, *63*, 9–23. doi:10.1177/000841749606300103

Mathews, T.J. & Hamilton, B.E. (2016). Mean age of mothers is on the rise: United States, 2000–2014. *National Center for Health Statistics, 232.* Retrieved from https://www.cdc.gov/nchs/data/databriefs/db232.pdf

Motherhood® Maternity. (n.d.). The Ultimate Maternity Belt. Retrieved on March 6, 2021, from https://www.motherhood.com/collections/maternity-shapewear/products/the-ultimate-maternity-belt-006-97610-006-001

Opala-Berdzik, A., Blaszczyk, J.W., Swider, D., & Cieslinska-Swider, J. (2018). Trunk forward flexion mobility in reference to postural sway in women after delivery: A prospective longitudinal comparison between early pregnancy and 2- and 6-month postpartum follow-ups. *Clinical Biomechanics,56,* 70-74. doi:10.1016/j.clinbiomech.2018.05.009

Pixabay. (2017). [Pregnant woman silhouette]. Retrieved March 6, 2021 from https://cdn.pixabay.com/photo/2017/09/16/22/25/pregnancy-2757032__340.png

Pregnancy Statistics. (2009). Pregnancy Statistics [Webpage]. Retrieved from http://www.pregnancystatistics.org/content/pregnancy-statistics.html

Queen Rose. (2021). Luxury Long U-Shaped Pregnancy Pillow (Gray). Retrieved March 6, 2021 from https://www.queenrose.com/collections/maternity-pillows/products/u-shaped-long-pregnancy-pillow-gray

Safety 1st. (2021). Grow and Go™ All-In-Once Convertible Car Seat. Retrieved March 14, 2021 from https://www.safety1st.com/grow-and-go-all-in-one-convertible-car-seat-cc138-s1-us-en.html?gclid=CjwKCAiAhbeCBhBcEiwAkv2cYzwqb77EgZXdokiXI_oFCr5Py0DAUan4iYFgnb-R2dt9PJYCBELXJRoCGDYQAvD_BwE

Sanders, M.J. & Morse, T. (2005). The ergonomics of caring for children: An exploratory study. *American Journal of Occupational Therapy, 59,* 285-295. doi:10.5014/ajot.59.3.285

Schroeder, S.J. (2013). Applying ergonomics principles to the job of baby care. *Work & Industry Special Interest Section Quarterly, 27*(3), 1–4. Bethesda, MD: American Occupational Therapy Association Inc.

Shende, E. & Salunkhe, P. (2020). Effect of graded spinal exercises in postnatal women. *Indian Journal of Physiotherapy and Occupational Therapy, 14*(2). 38-44. Retrieved from http://www.ijpot.com/scripts/IJPOT%20April-June_2020.pdf#page=45

Shivakumar, G., Brandon, A. R., Snell, P. G., Santiago-Muñoz, P., Johnson, N. L., Trivedi, M. H., & Freeman, M. P. (2011). Antenatal depression: A rationale for studying exercise. *Depression and Anxiety*, *28*, 234–242. doi:10.1002/da.20777

Signer, A. (2020, December 22). Both mom and baby need to have proper posture when using a baby sling [Web log post]. Retrieved from https://www.babygaga.com/motherhood-best-posture-when-using-baby-sling/

Sikorski, J., Renfrew, M.J., Pindoria, S., & Wade, A. (2003). Support for breastfeeding mothers: A systematic review. Paediatric and Perinatal Epidemiology, 17, 407-417. doi:10.1046/j.1365-3016.2003.00512.x

Sri Widiastuti, I., Rustina, Y., & Efendi, D. (2020). The use of breastfeeding pillow to reduce discomfort for breastfeeding mothers. *Pediatric reports*, *12*(Suppl 1), 8702. doi:10.4081/pr.2020.8702

Surtees, A., & Kelleher, D. (2011). Maternity focus: Techniques to support breastfeeding. *British Journal of Healthcare Assistants, 5*, 134-136. doi:10.12968/bjha.2011.5.3.134

The Noun Project. (n.d.). [Baby carrier silhouette]. Retrieved March 6, 2021 from https://static.thenounproject.com/png/498067-200.png

Therapeutic Associates Physical Therapy. (2016, February 4). Pregnancy exercises: Strengthen your pelvic floor, core, and posture [Web log post]. Retrieved from https://www.therapeuticassociates.com/pregnancy-exercises-to-help-strengthen-your-pelvic-floor-core-and-posture-muscles/

Vico Pardo, F. J., López Del Amo, A., Pardo Rios, M., Gijon-Nogueron, G., & Yuste, C. C. (2018). Changes in foot posture during pregnancy and their relation with musculoskeletal pain: A longitudinal cohort study. *Women and birth: Journal of the Australian College of Midwives*, *31*(2). doi:10.1016/j.wombi.2017.08.114

Visser, M., Nel, M., la Cock, T., Labuschagne, N., Lindeque, W., Malan, A., & Viljoen, C. (2016). Breastfeeding among mothers in the public health sector: The role of the occupational therapist. *South African Journal of Occupational Therapy, 46*(2), 65-72. doi:10.17159/2310-3833/2016/v46n2a11.

Vitality Medical. (2021). Maternity Support Belt by DJ Orthopedic. Retrieved March 6, 2021 from https://www.vitalitymedical.com/ maternity-support-belt-by-djorthopedic.html?feed_special=bing&utm_source=bing&utm_medium=cpc&utm_campaign=**LP%20-%20Shop%20-%20%27Braces-Splints-Supports%27%20-%20(%240-%24100)%20-%20General&utm_term=4581596234241336&utm_content=DJO319S_ea%20%7C%20Maternity%20Support%20Belt%20by%20DJ%20Orthopedic%20Small%203%20-%208%20Inch%20319S%20%7C%20%2433.25

Walmart. (2021a). Mainstays 13 in x 49 in Black Rectangle Door Mirror. Retrieved March 14, 2021 from https://www.walmart.com/ip/Mainstays-13-x-49-Door-Mirror/50110381?wmlspartner=wlpa&selectedSellerId=0&wl13=5806&adid=22222222420&wmlspartner=wmtlabs&wl0=&wl1=g&wl2=c&wl3=501107745824&wl4=pla-293946777986&wl5=1021449&wl6=&wl7=&wl8=&wl9=pla&wl10=8175035&wl11=local&wl12=50110381&wl13=5806&veh=sem_LIA&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY6Vbdl2S1jMMcBiFGpXejn1Q1gIqW-5z2uZVHpqcEAfO--BuyFvByxoCbowQAvD_BwE&gclsrc=aw.ds

Walmart. (2021b). Yoga Mat- Classic Pro Yoga Mat Eco Friendly Non Slip Fitness Exercise Mat – Workout Mat for Yoga, Pilates, and Floor Exercises. Retrieved March 14, 2021 from https://www.walmart.com/ip/Yoga-Mat-Classic-Pro-Yoga-Mat-Eco-Friendly-Non-Slip-Fitness-Exercise-Mat-Workout-Mat-for-Yoga-Pilates-and-Floor-Exercises/138493073?wmlspartner=wlpa&selectedSellerId=101033584&&adid=22222222227364976090&wl0=&wl1=g&wl2=c&wl3=463020006701&wl4=pla-949807804773&wl5=1021449&wl6=&wl7=&wl8=&wl9=pla&wl10=254049223&wl11=online&wl12=138493073&veh=sem&gclid=CjwKCAiAhbeCBhBcEiwAkv2cY7isYblpgdWHg02cA1NQjEsJ-8iW9sVGwmi8lyfQO0_guWGGwHJwhhoCoiYQAvD_BwE&gclsrc=aw.ds

Westerfield, K.L., Koenig, K., & Oh, R. (2018). Breastfeeding: Common questions and answers. *American Family Physician, 98*(6), 368-373. Retrieved from https://www-clinicalkey-com.ezproxy.library.und.edu/#!/content/playContent/1-s2.0-S0002838X18303058